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This above all: to thine own self be true,
And it must follow, as the night the day,
Thou canst not then be false to any man.
HAMLET - ACT I, SC. 3

IN MEMORY OF

Alexander James Wood

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DISEASES OF THE DOG

AND

THEIR TREATMENT

BY

DR. GEORG MÜLLER

PROFESSOR AND DIRECTOR OF THE CLINIC FOR SMALL ANIMALS AT THE VETERINARY
HIGH SCHOOL AT DRESDEN

AND

ALEXANDER GLASS, A. M., V. S. (McGill)

PROFESSOR OF CANINE MEDICINE IN THE VETERINARY DEPARTMENT,
UNIVERSITY OF PENNSYLVANIA

FIFTH ILLUSTRATED EDITION
REVISED AND ENLARGED

CHICAGO
ALEXANDER EGER, PUBLISHER
1926

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NOTE TO FIFTH ENGLISH EDITION.

The fifth edition in English is practically a new book and up to date. The work has been entirely revised from beginning to end. Everything has been carefully scrutinized and every endeavour made to correct any errors that might have crept into the former editions.

Special praise must be given to Dr. **A. A. Leibold,** who revised the German portion of the first part; Dr. **Paul Fischer,** who revised the German portion of the second part, and also to Mr. **Alexander Eger,** who rearranged index portion of this new fifth edition.

In placing another edition before the English speaking public the translator wishes to thank not only the profession at large, but also the large number of laymen who are interested in dogs and who have been so liberal in their praise in the past editions, and it is hoped that this new edition will meet with the same favourable reception.

ALEXANDER GLASS.

PHILADELPHIA, PA.,
January 2, 1926

PREFACE TO THE THIRD GERMAN EDITION.

In order to bring the third edition up to date a thorough revision of the whole book has been undertaken, and as a result of this determination almost the entire book has been rewritten and a number of new chapters have been added. Especial attention was given to the matter on diagnosis and therapeutics and in that the author has given the best of his knowledge and observation gained in his daily work in the clinic of small animals as Director of the small animal clinic in the Dresden School for thirty-three years. All material in the previous edition that will be of value to the reader has been retained. To make the text clearer to the reader only a few quotations from other authors have been used. A number of new plates have been added, replacing in some cases older ones and some that were deemed unnecessary have been eliminated.

DR. GEORG MÜLLER.

LOSCHWITZ,
November, 1921.

NOTE TO FOURTH ENGLISH EDITION.

Notwithstanding the fact that the European cataclysm has halted investigation in so many branches of science, the present edition has been carefully revised and amended to date in the light of late investigation and experience. Several of the chapters have been remodelled and their scope, importance and practical value greatly extended.

In the field of serum therapy, particular care has been given to the work of recent investigators to discover a prophylactic serum for canine distemper that would lessen the great mortality among the very valuable animals that are now being bred in such great numbers. The author has based the deductions he now presents not only on these investigations but also on his own observations and research. The subject of serum therapy is carefully and thoroughly analyzed.

Among other chapters in which important changes have been made are those on Infectious Hemorrhagic Gastro-enteritis, commonly called "Black Tongue," and on the internal parasites, both of which have been reconstructed, the latter with special reference to what in America is termed the "Hookworm."

The author hopes that the new edition will prove of greatly extended usefulness, both in form and fact.

ALEXANDER GLASS.

PHILADELPHIA, PA.,
April 26, 1916.

NOTE TO THIRD ENGLISH EDITION.

The present edition of this work has been entirely re-written, a large amount of new material added, and every endeavor has been made to bring the work up to the standard of the present day. While preparing the manuscript of this edition the second edition of Dr. Müller's work has appeared and has been closely scrutinized and all valuable additions incorporated in this work. One portion of this work that differs materially from the German is that of therapeutics. In the practice of Canine medicine, where we must necessarily administer medicine by force, concentration of the dose is very essential; the writer cannot impress too strongly on the practitioner and student that the constant aim must be to administer all drugs in doses as small and compact as possible, for it frequently happens that the excitement caused by the repeated administration of large amounts of decoctions and infusions in nervous or highly bred animals does more harm than the original disease.

The writer is under great obligation to Dr. Preston Hoskins for his suggestions and his careful reading of the proof; to Drs. Spang, Sommer and Jureasu for their assistance in translation, and to Dr. Meyer for his aid in the chapter on rabies.

ALEXANDER GLASS.

PHILADELPHIA, PA.,
September 1, 1911.

NOTE TO SECOND ENGLISH EDITION.

Knowing that many active and enthusiastic observers are working constantly in the line of diseases of direct contagion this edition has been delayed in the hope that some new and important discovery of original research would be made, and to a certain extent we have been rewarded by the work of Babes and of Negri in respect to the quick diagnosis of Rabies. It has been thought possible that some one might be able to make a culture of Distemper in dogs that would by inoculation of the young animal render it either immune or at least slightly susceptible to this disease. This, however, has not yet been accomplished.

While the plan of the work, the admirable arrangement of which is due to Dr. Müller, has not been changed a great number of alterations have been made. The articles on Distemper, Rabies and Tuberculosis have been remodeled, and the therapeutics throughout the work have been brought up to the standard of the present day, the tendency of which appears to be, and rightly, to use as little medicine as possible and in small and convenient doses; and to pay particular attention to hygiene, good nursing, and sanitation in kennels.

I am indebted to Dr. John Reichel for assistance in the pathology of Rabies, and to Walter McDougall for drawings. Plates in color after my own photographs have been added.

ALEXANDER GLASS.

NOTE TO FIRST ENGLISH EDITION.

While lecturing on the diseases of the dog the writer recognized the fact that there was not in existence a work that could really be called a text-book for the student and the practitioner; there were then, and have been issued since, a number of "popular" works that endeavored to fill the dual rôle of text-book for the veterinarian and a "Dog Book" for the layman; these, as a rule, have been inadequate for the former and confusing to the latter. With the purpose of supplying this want the writer, several years ago, began to write a book on the subject, but two years ago read this work by Professor Müller, and instantly recognized its value as a text-book: every detail in the diseases of the dog being carefully considered, and the whole so admirably arranged that the student can readily find and study any subject in a clear and condensed form.

He secured from the author the right of translation, and has made it as exact as possible. perhaps in some parts too literal, but has done so in the endeavor to closely follow the original. He has also added, in the proper places, the results of his own observations, and also everything of value that has been added to veterinary science since the appearance of Dr. Müller's work. thus making a second and much enlarged edition.

The metric system, as in the German work, has been followed, with the hope that its use may be a slight aid to the general adoption of what may be the future international system of measurement.

ALEXANDER GLASS.

CONTENTS

PAGE

General examination 1
- the psychological condition 3
- the structure and constitution of the body 4
- the nutritive condition 5
- the mucous membranes of the head 6
- skin and subcutaneous tissue 8
  - œdema 9
  - emphysema 9
  - lymphatic glands 10
- the temperature 14
  - increased temperature 15
  - subnormal temperature 17
  - local temperature 18

Diseases of the digestive apparatus 19
- the examination of the digestive apparatus 19
  - the condition of the throat and mouth 20
  - condition of the œsophagus 28
  - condition of the abdomen 29
  - condition of the stomach 31
  - the digestion of milk in the stomach 36
  - action of digestion on hydronaceous food 37
  - the condition of the bowels 37
  - physical examination of the intestines 42
  - the fæces 47
  - condition of the liver 52
  - the spleen 54
  - the pancreas 55
- diseases of the mouth, tongue, and salivary glands 55
  - inflammation of the mucous membrane of the mouth-stomatitis 55
  - ulcerous inflammation of the mucous membranes of the mouth 57
  - foreign bodies in the tongue 59
  - gangrene of the tongue 59
- diseases of the teeth 60
  - dentition 66
  - malformations of the cavity of the mouth 67
    - warts in the mouth 69
    - ranula 69
- diseases of the salivary glands 70
  - parotitis—mumps 70
  - inflammation of the mucous membrane of the throat 75
- diseases of the œsophagus 77
  - foreign bodies in the œsophagus 77
  - injuries and other diseases of the œsophagus 81
  - strictures of the œsophagus 82

Diseases of the digestive apparatus—*Continued.* PAGE

- dilatation of the œsophagus 82
- paralysis of the œsophagus 83
- diseases of the stomach 84
  - acute catarrh of the stomach 84
  - chronic catarrh of the stomach 87
  - other disorders of the stomach 89
- diseases of the intestines 92
  - intestinal catarrh 93
    - mycotic inflammation of the stomach and intestines 101
  - constipation 102
  - obstipation 103
  - prolapsus of the rectum 114
  - malformations of the rectum and anus 119
  - imperforate anus 121
  - hemorrhoids 124
  - intestinal parasites 125
    - round worms 125
    - tapeworms 128
    - oxyuris vermicularis 141
    - uncinaria canina 141
    - whip worm 143
- diseases of the peritoneum 144
  - inflammation of the peritoneum 144
  - abdominal dropsy 149
- diseases of the liver 156
  - catarrhal jaundice 156
  - hyperæmia of the liver 160
  - inflammation of the liver 161
    - acute parenchymatous inflammation of the liver 161
    - interstitial hepatitis 162
    - abscess of the liver 163
  - fatty liver 163
  - neoformations of the liver and gallstones 163
  - amyloid liver 164
  - lardaceous liver 164
- poisons 165

Diseases of the respiratory organs 171

- the physical examination of the respiratory apparatus 171
  - examination of the nose 171
  - the condition of the larynx and windpipe 175
  - condition of the lungs 177
    - shape of the cavity of the chest 178
  - number and character of the respiratory movements 179
  - cough 181
  - percussion of the thorax 185
  - ausculation of the lungs 188
- diseases of the nasal cavities 193

Diseases of the respiratory organs—*Continued.*

PAGE
catarrh of the nose ... 193
pentastoma tænioides ... 193
epistaxis ... 194
rhinorrhagia ... 195
tumors ... 197
diseases of the larynx ... 201
acute laryngeal catarrh ... 201
chronic catarrh of the larynx ... 203
hemiplegia laryngis ... 206
diseases of the upper air-passages and bronchial tubes ... 207
catarrh of the windpipe and bronchia ... 207
acute catarrh of the large bronchia ... 209
acute catarrh of the smaller bronchia ... 210
parasitic bronchitis ... 214
diseases of the lungs ... 214
catarrhal inflammation of the lungs ... 214
chronic interstitial pneumonia ... 217
œdema of the lungs ... 218
croupous inflammation of the lungs ... 220
anthracosis pulmonum ... 220
emphysema of the lungs ... 220
diseases of the pleura ... 222
pleuritis ... 222
hydrothorax ... 229
pneumothorax ... 230
hæmatothorax ... 231

Diseases of the circulatory apparatus ... 231
examination of the circulatory apparatus ... 231
examination of the heart ... 231
position and size of the heart ... 232
character of the heart-pulsations ... 234
character of the heart-sounds and bruits ... 235
character of the pulse ... 238
diseases of the heart ... 240
valvular defects ... 242
diseases of the heart muscles ... 246
idiopathic hypertrophy and dilatation of the heart ... 246
other heart diseases ... 248
diseases of the pericardium ... 249
pericarditis ... 249
dropsy of the pericardium ... 251
hemorrhage of the pericardium ... 252
diseases of the blood vessel; worms in the blood ... 252
filaria in the blood ... 253

Diseases of the urinary apparatus ... 254
examination of the urinary apparatus ... 254
examination of the urethra ... 254

Disease of the urinary and sexual apparatus—*Continued.* PAGE

examination of the prostate 259
examination of the bladder 259
examination of the kidneys 259
examination of the urine 259
  amount of urine 261
  color of urine 262
  odor of the urine 264
  transparency and reaction of the urine 264
  the specific gravity of the urine 264
  foreign substances in the urine 265
diseases of the kidneys 276
  inflammation of the kidneys 276
    acute inflammation of the kidneys 277
    chronic inflammation of the kidneys 280
  amyloid kidney 283
  abscess of the kidneys 283
  inflammation of the pelvis of the kidney 284
  hydronephrosis 285
  cysts of the kidneys 285
  nephritic stones 286
  tumors of the kidneys 286
  animal parasites of the kidneys 286
  urinary poisoning 287
diseases of the bladder 288
  catarrh of the bladder 288
  debilitated conditions of the bladder 292
  stone in the bladder 294
    urethrotomy 298

Diseases of the sexual organs 303
  male sexual organs 303
  prepuce and penis 303
  scrotum and testicles 304
prostates 305
  female sexual organs 306
  vulva and vagina 306
  uterus and ovaries 308
  udder 309
diseases of the male sexual organs 309
diseases of the prostate 309
  inflammation of the prostate 309
    hypertrophy of the prostate 311
  tumor of the prostate 312
diseases of the penis and prepuce 313
  phimosis and paraphimosis 313
  gonorrhœa of the prepuce 314
    specific gonorrhœa 314

Diseases of the sexual organs—*Continued.*

PAGE

neoformations of the glands and prepuce ... 315
diseases of the testicle and its coverings ... 316
inflammation of the scrotum ... 316
injuries to the testicle and scrotum ... 318
euterebro emasculator ... 319
diseases of the female sexual organs ... 321
diseases of the vagina and uterus ... 321
inflammation of the vulva and vagina ... 321
prolapsus of the vagina and uterus ... 322
diseases of the uterus ... 325
inflammation of the uterus ... 325
catarrhal metritis ... 325
septic metritis ... 326
obstetrics ... 329
irregularities of the sexual instinct ... 333
castration of the bitch ... 334
diseases of the mammary gland ... 337
inflammation of the mammary gland ... 337
neoformations of the mammary gland ... 338

Diseases of the nervous system ... 339
examination of the nervous system ... 339
disturbances of psychic functions ... 341
disturbances of sensitiveness ... 342
disturbance of motility ... 343
diseases of the brain and its coverings ... 350
hyperæmia of the brain ... 350
anæmia of the brain ... 351
cerebral hemorrhage ... 352
traumatic lesion ... 354
inflammation of the brain ... 354
comparatively rare diseases of the brain ... 357
diseases of the spinal cord and its membranes ... 359
cerebro-spinal meningitis ... 358
inflammation of the spinal cord and its membranes ... 359
paralysis of the nerves ... 368
epilepsy ... 372
chorea ... 375
eclampsia of nursing bitches ... 377
catalepsy ... 379

Diseases of the thyroid gland ... 382
base dow's disease ... 382
hypertrophy of the thyroid gland ... 383

Diseases of true infection ... 386
distemper ... 386
infectious bronchial catarrh ... 402
infectious hemorrhagic gastroenteritis ... 404

Diseases of true infection—*Continued.* PAGE

septic and pyæmic diseases 408
septicopyæmia and septicemia 408
malignant œdema 409
anthrax 410
rabies 411
tuberculosis 425
hemoglobinuria and piroplasmosis 433
tetanus 437

Diseases of the blood and metabolism 440
constitutional diseases 440
microscopy of the blood 440
anæmia 440
leukæmia and pseudoleukemia 442
diabetes mellitus 446
diabetes insipidus 448
obesity 449
scurvy 451
Priessnitz's bandage 452

Diseases of the organs of locomotion 453
diseases of the bones 453
rhachitis 453
fractures of the bones 456
diseases of the articulations 469
inflammation of the joints 469
acute synovial inflammation of the joints 470
chronic synovial inflammation of the joints 471
purulent inflammation of the joints 471
rheumatic inflammation of the joints 472
disease-producing malformation of the joints 473
injuries of the joints 476
wounds of the joints 476
contusions of the joints 478
distortions of the joints 478
luxation of the joints 479
dislocation of the lower jaw 481
dislocation of the elbow 481
dislocation of the patella 482
diseases of the muscles 486
muscular rheumatism 486
cysticercus and trichnia 488
diseases of tendons and bursa mucosa 489

Wounds 492
wounds of special character 492
erysipelas 492
ulcers and ulcerations 492

PAGE

Contusions 493

Diseases of the claws and foot-pads 502
- ingrowing claws 502
- inflamed claw 503
- contusions and wounds of pads 505
- amputation of the toe 504
- inflammation of the interdigital web 506

Hernial rupture 508
- abdominal hernia 508
  - description of hernia 508
  - reducible hernia 509
  - irreducible hernia 510
- inguinal hernia 514
  - castration of male 515
  - sarcocele 518
  - hydrocele 518
- umbilical hernia 518
- femoral hernia 520
- perineal hernia 521

Diseases of the eyes 523
- affections of the eyelids 523
  - adhesion of the eyelids 523
  - entropion 523
  - ectropion 525
- diseases of the conjunctiva 530
  - inflammation of the conjunctiva 530
  - catarrhal conjunctivitis 531
  - purulent conjunctivitis 532
- diseases of the cornea 535
    - inflammation of the cornea 535
    - keratitis superficialis 536
    - keratitis profunda or parenchymatosa 537
    - abscess of the cornea 538
    - ulceration of the cornea 539
- dermoid of the cornea 543
  - pterygium 544
  - injuries to the cornea 544
- diseases of the lens, cataract 547
- diseases of the sclerotic membrane, of the nervous portion of the eye, and of the vitreous humor 553
- diseases of the uveal tract 553
  - the iris 553
  - inflammation of the iris 555
  - purulent inflammation of the eye 555
  - dropsy of the anterior chamber (glaucoma) 556
  - inflammation of the optic nerve and the retina 558

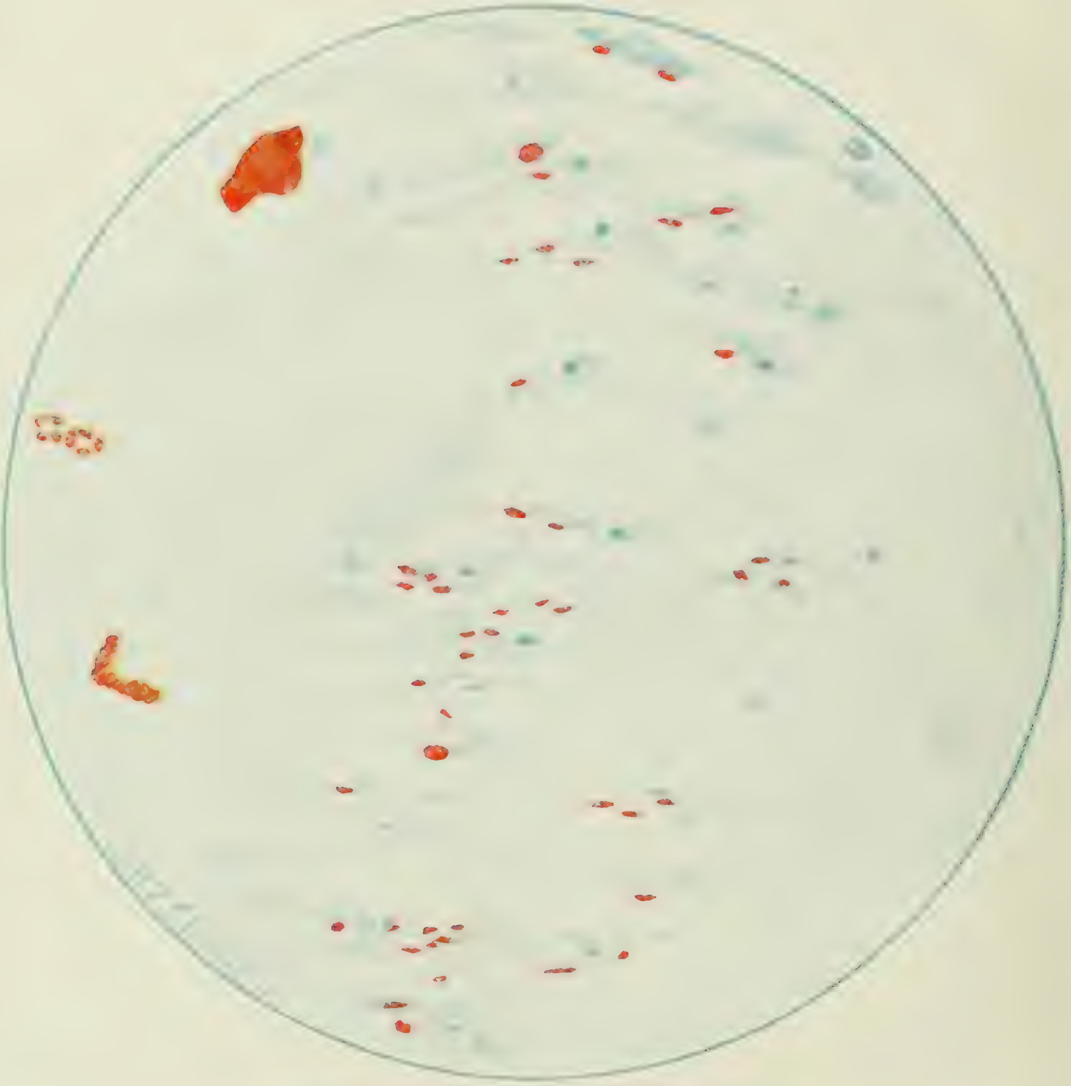
Diseases of the eyes—*Continued.* PAGE
- prolapsus of the eyeball 559
- amaurosis, black cataract 559
- strabismus 562

Diseases of the ear 564
- serous cyst 564
- external canker 568
- internal canker (otitis) 570
- deafness, partial or complete 576
- parasitic canker of the ear 577

Diseases of the skin 579
- inflammatory conditions of the cutaneous membrane 579
  - erythema 580
  - urticaria 582
  - eczema 583
  - acne 593
  - alopecia 597
  - pruritus 598
- cutaneous affections caused by animal parasites 603
  - ceratopsyllus canis 604
  - hæmatopinus piliferus 605
  - characteristics of trichodectes 605
  - ixodes ricinus 606
    - leptus autumnalis 606
- cutaneous diseases due to animal parasites 608
  - sarcoptic mange 608
- follicular mange 612
  - demodex folliculorum 612
  - filaria 618
- cutaneous affections caused by vegetable parasites 618
  - favus 619
  - herpes tonsurans 620
- trypanosomiasis 622

Tumors 623
- soft and hard fibroma 623
- lipoma 627
- sarcoma 627
- papilloma 629
  - warts 629
  - flat condyloma 629
- carcinoma 630
- myxoma 632
- adenoma 633
- angioma 633
- myoma 633
- chondroma 634
- venereal granuloma 634
- infectious genital tumors 634

Intravenous injections and infusions 642



NEGRI BODIES (HIPPOCAMPUS)

[illegible]

Carmine: Negri bodies.   *Light blue: Ganglion cells.*

[illegible]

[illegible]

DISEASES OF THE DOG

GENERAL EXAMINATION

In making an examination of the dog for the purpose of diagnosis it is best to class it under two heads: a general and a special examination.

The general examination, used when the organism is considered as a whole, is the method generally followed in surgical diseases, as in the case of an injury where we first carefully examine the injured region and then direct our attention to the other parts of the body.

The special examination is made when we consider single special organs of the body, particularly those of secretions and excretions. If our attention is called to some specially striking symptom, we at once examine a certain organ or group of organs. Frequently, for more certain diagnosis, it is necessary to make a microscopical examination of the blood, urine, or fæces; or by means of a trocar obtain some of the contents of certain cavities or tissues of the body to ascertain their true character and composition. The Röntgen rays are also used to obtain a photograph of some foreign body or pathological alteration of the inner structures; or the skin examined to detect the presence of parasites or their embryos; and it may be necessary in some instances to inoculate another animal or series of animals with the virulent material of some disease to confirm a diagnosis.

Before beginning the examination of a sick dog the owner of the dog or the person who has had the main care, feeding or exercising of the animal should be questioned carefully in order to secure as exact and faultless an anamnesis (history of the case) as possible. This is

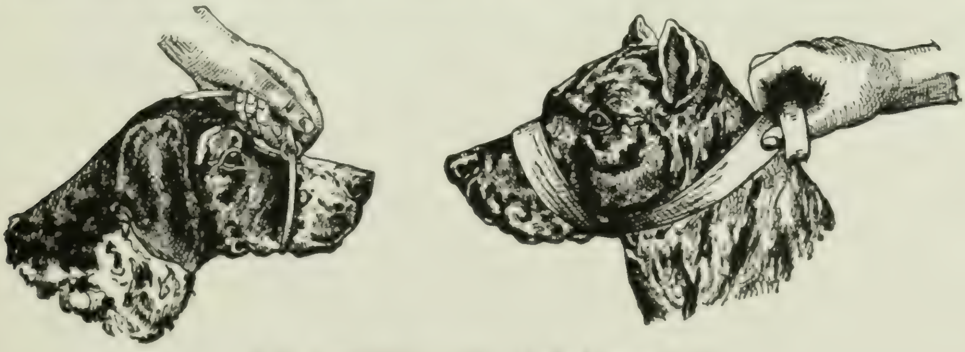


Fig. 1.—Manner of tying the mouth.

not only necessary in determining the course to be followed in the examination (s. above) and the making of the diagnosis but because in certain instances it can be of vital importance in the interests of the person making the examination. For example: During a conversation with the owner, the person intending to make the examination might discover that the dog brought to him "because something is lodged in the throat" may really be a possible case of rabies and must therefore be examined with special precautions by carefully exploring the mouth and throat cavities and not as the owner may desire. Furthermore, it is also advisable to examine the patient very carefully before beginning the actual examination in order to determine whether in addition to the ailment designated by the owner the dog may not be afflicted with a disease such as herpes or favus, which can easily be conveyed to humans. In such cases the incommunicable auscultation can for example become dangerous to the examiner.

During the inquiry into the anamnesis it is also advisable to find out whether the dog to be treated is gentle or vicious and snappy. If the latter be the case then a well-fitting muzzle must be put on the dog before handling him or his mouth must be held shut according to one of the methods described in Ill. 1. In case of catarrhal conditions of the nose care must be exercised not to interfere with the breathing when tying together the jaws of short-headed dogs (pugs, bulldogs, griffous Bruxellois). This method of tying cannot be employed at all with dogs who for any reason have to breathe through the mouth (s. later: Examination of respiratory organs). In the case of gentle dogs the examination can be made without tying shut the mouth and usually without a muzzle, as soon as the owner holds the animal's head. Also instances undoubtedly occur, especially with ladies' and lap dogs, when the animal can be examined more satisfactorily when the owner is absent than when he or she is present.

Very large dogs are usually examined standing or lying on the floor; all others can be examined better on a table upon which the animal has been placed by the owner, or by the owner and an assistant, who takes charge of the hind-quarters. As a rule the examination is carried out, according to the position of the animal, either standing or lying, under ordinary circumstances (s. above) by the owner holding the dog. To avoid being taken by surprise it is advisable to constantly keep an eye on the dog's head during the entire examination.

In making a general examination the following points have to be observed: 1. The psychological condition; 2. the structure and constitution; 3. the nutritive condition; 4. the mucous membranes of the head;

5. the skin and subcutaneous membranes; and 6. the temperature of the body.

1. THE PSYCHOLOGICAL CONDITION

The psychological condition of the dog suffering from any bodily ailment presents more rapid and marked changes than any other animal. Even in slight indispositions, such as disturbances of the stomach and digestive apparatus, the animal will be downcast, irritable and nervous, and often show a disinclination to move, or may change constantly from one place to another. Nervousness, a staring look in the eyes, great restlessness, constant barking or howling point to beginning of congestion of the brain. But these symptoms may also be found in a number of other diseases; for instance, in case of pentastomes in the nose or cavity of the forehead, in cases of parasites of the intestines, in rabies and distemper.

Howling, crying and moaning are observed in a great many of the various painful diseases, particularly in disorders of the stomach and intestines. Colic of the intestines may present great nervous excitement; a nervous animal sometimes will swallow indigestible substances, foreign bodies, show a tendency to bite, but that does not necessarily mean that the animal has rabies; but if this is accompanied by a hoarse, howling bark and a staggering gait, it will change the existing suspicion to a certainty.

Sometimes very violent demonstrations of pain are shown in case of torsion of the stomach. The occasionally noticed sighing of dogs that are resting which consists of a deep, slow inspiration followed by a noisy expiration is of no more special significance than the jerky hiccoughs (Singultus) caused by diaphragmatic contractions. The latter is sometimes observed in the course of other characteristic symptoms during the progress of nervous distemper and irritated conditions of the digestive system.

Symptoms resembling rabies may appear from the presence of pentastomes in the nasal cavities, from tænia ecchinococcus in the intestines, foreign bodies between the teeth, in the pharynx, stomach and intestines, or as the result of continuous sexual excitement. Further, we may have uncontrollable movements which are caused by changes in the psychological condition; they appear in certain circumscribed diseases of the cerebrum and cerebellum or from cysts, tumors, abscesses, hemorrhages of the brain and in certain forms of poisoning or from distemper, slight convulsions, etc., but this subject will be taken up in detail later on.

Dullness or total indifference to external influences, staring expression of the eye, a slow creeping gait, sleepiness or coma (entire unconsciousness), are seen in the various diseases of the brain and its coverings, from injury to the skull, or to shock, in serious infectious diseases, such as distemper, septicaemia and infectious hemorrhage, gastroenteritis, in poisoning by some narcotics, or uræmia, acute jaundice, acute anæmia and in all diseases that are terminating fatally.

In some cases we see short attacks of unconsciousness brought on by great excitement and pain, as in surgical operations, cysts in the brain, anæmia, continued hemorrhage, abscess or tumors in the brain, effects of certain poisons. Furthermore, certain rudimentary forms of epilepsy appear only with the appearances of dizziness (staggering, falling down). Feeble-mindedness, slight power of comprehension, stupid actions, etc., are often seen as lasting results of diseases of the brain as well as of nervous distemper; sometimes congenital cretinism also appears, which is then usually accompanied by defective physical development, deformity or a dwarfed condition. Furthermore, dogs with very large goiters, even those of malignant nature, often show symptoms of cretinism in their behavior. In making an examination of the psychological condition of an animal, we must always take into consideration the fact that the symptoms may be very much modified by the presence of strangers or the veterinarian; on the other hand, pet dogs may often hide certain symptoms, or from fear may present symptoms that are very much exaggerated. In the latter case, in addition to the temperament, the influence of the dressur is often of great importance.

Very sick animals will not rise when called by a stranger or even by the owner when a stranger is present, while a healthy animal will rise or bark, and show its presence in various ways. The position of the animal when lying down is to a certain extent a diagnostic symptom. Dogs which are affected by lateral or one-sided diseases of the chest, for instance lateral pneumonia, pleurisy or pneumothorax, will take a sitting position or lie on the sternum with the legs under the body. Dogs affected by unilateral thoracic diseases are apt to lie on their side, usually on the diseased but sometimes on the well side, while dogs suffering severely from impaired respiration, especially in severe bilateral pleurisy, hydrothorax, ascites, generally assume a sitting position or lie on the sternum with legs under the body.

2. THE STRUCTURE AND CONSTITUTION OF THE BODY

The development of the skeleton may be used as a basis for determining what sort of constitution an animal has, at the same time taking into consideration the great difference there is in form between the different breeds of dogs in the strength and shape of the bones; we can frequently obtain some diagnostic information concerning a defective constitution from the following indications: of softness of bones, there are flat non-arched ribs, a narrow chest, a marked change in the shape of the skeleton, the swelling of the ends of the ribs at the union of the bone to the sternum, by the contortions of long bones, and a swelling of the joints as seen in all rachitic animals. For further information on this subject see the article on the examination of the respiratory apparatus. In rare instances there is a marked deformity of the spinal column, an upward curvature (kyphosis), a lateral curvature (skoliosis), an upward and lateral curvature (kyphoskoliosis), and a downward curvature (lordosis).

3. THE NUTRITIVE CONDITION

The general condition may depend, to a large extent, on the age of the animal, how he has been fed, and the amount of exercise he has had, but, as a general rule, if the animal's condition is poor, it is due to the presence of some disease. The skin, to a certain extent, is a diagnostic guide; if the animal is healthy the skin will be loose and pulled easily from the different parts of the body, whereas in diseases it is tight and loses its softness and smooth feeling to the fingers. The body loses its symmetry, the eyes are sunken in their sockets. In slight cases of emaciation we must depend, to a certain extent, on the history of the cases from the owner. Weighing the animal is also useful to determine whether an animal is gaining or losing during the course of treatment; this is especially valuable where the animal is being reduced in cases of plethora, or in convalescence from acute disease; the gain shows that the animal is improving; but at the same time we must not lose sight of the fact that we may have an increase of weight from œdema, or any dropsical condition. It is also important to remember that an increase in weight may be caused by pathological products, especially edenia and cavity discharges and that continued checking on the body weight can only then offer definite evidence of the condition of the patient when the weights are always determined at the same time of day and it is best done early before eating or drinking anything and after defecation and urination. A moderate emaciation (a slightly impaired nutritive condition) can occur with the various internal and with some external diseases, especially if these are accompanied with lack of appetite. A rapid emaciation is seen in diseases of the digestive apparatus, in all acute and chronic feverish affections, in certain cases of poisoning, and in rabes. A gradual loss of flesh may be seen in cachexia, as a result of chronic infections and constitutional diseases, such as tuberculosis, leukæmia, diabetes, carcinoma, and in chronic nephritis. A slight loss of flesh is also seen following surgical operations. As an opposite to emaciation, we may see a rapid accumulation of adipose tissue; this may occur from laziness, a disinclination to take exercise or resist it when forced to do so, or to close confinement where the animal is the pet of a sick person. Disturbances of the respiratory and circulatory apparatus have a tendency to produce accumulations of fat in the abdominal and thoracic walls, in the pericardium, and in the heart.

4. THE MUCOUS MEMBRANES OF THE HEAD

In making a general examination, the first thing to do is to examine the visible mucous membranes, to see the color of them, the conjunctiva, and also of the mouth and throat. It is best to examine more than one mucous membrane, as the examination of one only may lead to an error in diagnosis. Rapid exercise, particularly in hot weather or in high wind, may produce a temporary congestion of the mucous membranes. Reddening of the eyes is often a perfectly normal condition in some breeds of dogs. Abnormal paleness of the mucous membranes may be due to decrease in the amount of blood in the system from severe internal or external hemorrhage, or from slight but frequent hemorrhage internally. It may be due to decrease in the amount of hæmoglobin in the blood corpuscles, in diseases peculiar to the blood, as in anæmia, leukæmia, pseudo-leukæmia, and in all diseases producing great loss of fluids, such as disease of the kidneys, disease of the stomach and the bowels, in tuberculosis, carcinoma and also in slow pus formations that are accompanied with or without fever, in defective heart action, as in collapse, where the heart's action is, to a certain extent, paralyzed for the time, as in many acute diseases or violent poisons, or from depressing drugs; also in diseases of the heart and its covering, the pericardium. A blue or cyanotic coloring is sometimes seen where there is defective oxygenation of the blood and it is loaded with carbon dioxide. This is also seen where the blood in the lungs does not come in contact with oxygen, as in contraction of the trachea or larynx, or by the inflammation or swelling of these parts, foreign bodies, internal or external tumors, pressing on the air-passages; also in acute bronchitis, in the various forms of pneumonia, in large pleuritic exudates, in hydrothorax, in severe ascites where the diaphragm is pressed on, in rigidity of the muscles, as in eclampsia in bitches, in strychnine poisoning, and in some heart affections; in cases of defective blood circulations in the capillaries, from disease of the heart, especially if there is fatty degeneration; from defective valvular action, from deposits on them; from pericardiac exudates; from the action of poison acting directly on the heart; or from some injury or pressure on the jugular; in diseases where there is a great accumulation of blood in the head, as in acute hyperæmia of the brain and inflammation of the brain. In the latter case the redness of the mucous membrane is lighter in color or more of the arterial tint. As a rule in distemper the conjunctiva becomes bright red, more or less swollen, and a purulent discharge exists; however these can occur in a number of other serious internal diseases as well as purely localized disease processes of the eyes. Gray or yellowish gray mucous discharges collected in sago-like lumps in the internal angles of the eyes are often found in severely emaciated, cachectic dogs. A yellow color (icteric) generally denotes some disorder of the liver, such as gastro-duodenal catarrh, causing a swelling and obstruction of the ductus choledochus; occasionally, from calcareous deposits or foreign bodies in the bile-ducts or the presence of tumors that press on the bile-ducts. In rare instances these yellowish discolorations may be due to disturbances of the liver cells, or from such poisons as phosphorus and, in extremely rare cases, from mycotic meat poisoning and infectious diseases. The icterus which appears in phosphorus poisoning is due to biliary engorgements, and decomposition of the blood. Various spots or red patches known as petechial spots are seen on the mucous membranes of the head. These are a valuable aid to diagnose certain internal diseases, such as phosphorus poisoning, scurvy, meat poisoning, and in septicæmia.

The nasal and buccal discharges are treated fully under the head of Examinations of the Digestive and Respiratory Apparatus. We will only consider here such discharges from the eye as seen in very sick animals and are due to acute febrile disturbances. In some cases the pad of fat that fills the posterior part of the orbital cavity is very rapidly absorbed and the eye has a sunken look; the fever may produce an irritation to the mucous glands surrounding the eye and cause the accumulation of a profuse mucous discharge, varying in color from gray to grayish-yellow, seldom pure yellow. This accumulates about the corners of the eyelids, or may even close and glue up the eyelids entirely; this is not a symptom of true conjunctivitis, but some acute disorder involving the entire system. In scurvy, which is very rare, hemorrhages in the mucous membranes are a never-failing occurrence.

5. SKIN AND SUBCUTANEOUS TISSUE

The skin presents a number of conditions which are diagnostic. Of course, there are a number of local diseases of the skin which are treated in detail in section on Skin Diseases. The skin changes in color are seen mainly on the belly and inner surface of the thigh; a reddened or slightly yellow color is to be classed under the same head as if it had been present on the mucous membrane. The same is true in case of skin hemorrhages (Sugillations, Echymoses, Peteches, Vibices), if these are not merely the result of local influence.

Occasionally a conspicuous sharply-demarcated flat-like or spotted dark coloring, in contrast with the surrounding lighter color, is noticed on parts of the body that are bare or scantily covered with hair, namely, on the belly and on the inner surfaces of the thighs. Such a condition is of no more vital importance than the yellow or brown discoloration which the skin of the belly of bitches so often shows and which has been compared with the chloasma uterinum of the human (Fröhner); that is, if the skin is very red it indicates a high temperature or the commencement of some sympathetic skin eruption; or if it is yellow it indicates some disturbance of the liver or portal system. In cases of distemper we often see a pustular eruption on the abdomen and inner surface of the thigh (the exanthema of distemper—dog-pox); this is a very prominent diagnostic symptom of the disease. The same is also true of nettle rash (urticaria) which, occasionally resulting from certain gastric conditions, but also from other internal (and even external) causes, is first evident by red welts on the skin. The skin of a sick dog is very dry and hard, it is very hot in cases of intense fever, and cold in animals that are very much debilitated, or after severe external or internal hemorrhage, or collapse from shock. In fat dogs the skin

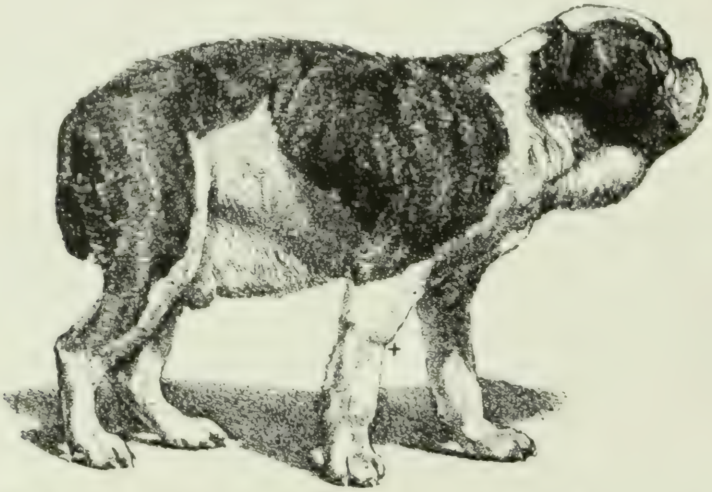


FIG. 2.—Dog with œdema of the skin. + marks indentation made by the pressure of the finger.

has a very unpleasant greasy feel to the touch. An unfavorable symptom of disease is when a fold of the skin is lifted by the hand and remains in the same position when released. Profuse perspiration is rarely seen in dogs except where they may have been badly frightened. Dogs do perspire constantly, but it is insensible perspiration. It is alleged that the bare (hairless) African dogs do perspire freely from heat or as a result of rapid running.

The hair is also a useful guide in diagnosis. In sick, badly fed, or neglected animals, or if they are infested with parasites, it loses its gloss, becomes dry and brittle, breaking easily, and in some cases falls out partially or entirely, and is often accompanied by a very marked desquamation of the epidermis in the form of dry, grayish-white or yellowish crusty scales, or by a hypersecretion of the sebaceous glands, resulting in the excretion of fatty, oil-like masses that cause the hair to stick together in bunches (s. later: Seborrhœa). As a rule, in all dogs that have undergone a severe illness, the hair falls out to a large extent; in bitches that have nursed a large litter of puppies, the hair falls out in large quantities after weaning. If disturbances occur in the shedding of the hair, it may be due to similar causes but also due to insufficient or improper feeding and insufficient care of the skin, and, for example. if the shedding which normally occurs in the spring and fall over a period of a few weeks does not completely take place or continues throughout the entire year. The hair turning gray on the head of old animals is a physiological process. The odor of the skin can be of importance since the sweat has a bad odor with very sick dogs, especially in cases of distemper, Stuttgart's disease, septicæmia or meat poisoning, especially when nearing the fatal end; nevertheless dogs suffering from certain skin diseases, and also neglected and filthy dogs as well as those afflicted with distemper exanthema, may have an unpleasant odor (s. later: Examination of Digestive Organs). A characteristic urinary odor can often be detected in case of acute uræmia after rupture of the bladder. The odor of the skin is sometimes very offensive, especially in dogs suffering with distemper and septicæmia, meat poisoning, infectious hemorrhagic gastro-enteritis, and certain skin affections, and in animals that are neglected and filthy.

Œdema and emphysema of the skin are very important diagnostic points. By œdema or dropsy of the skin (anasarca) we understand it to be an abnormal accumulation of fluids in the skin and the subcutaneous cellular tissues. This condition is caused by the fluids not being reabsorbed by the lymph vessels in the same proportion that they come out of the blood vessels. We recognize œdema by a swollen or bloated, painless, cool condition of the skin, with the obliteration of all wrinkles; if the swelling is pressed with the finger, the indentation remains visible for some time (Fig. 2); this may come from a number of diseased conditions, and it is seen sometimes over the entire body, but chiefly in the lower portions of the body and extremities, testicles, prepuce, scrotum, abdomen and chest. It occurs as a complication in diseases of the heart, especially where there is imperfect valvular action, in acute and chronic disorders of the kidneys and cirrhosis of the liver and in the majority of prolonged acute affections. In rare instances it is caused by true diseases of the blood—anæmia, leukæmia, and pseudo-leukæmia, abdominal dropsy, hydrothorax, and dropsy of the pericardium.

The œdema which appears in the locality of an inflammation (collateral œdema) is of special interest to the surgeon, as it is the only visible symptom of the inflammatory process that is going on under the skin. Œdema may be also seen as a result of the pressure caused by tight or improper bandaging.

Emphysema of the skin is where the skin looks as if there was air in the subcutaneous tissue. As a rule it is confined to small circumscribed parts of the body, but it has been observed by the author where the whole body has been involved. There is an intense swelling of the parts, and on pressure with the finger the indentation, unlike œdema, immediately disappears. On rubbing over the parts with the hand a slight crackling sound can be heard and felt; on pressure, the air can be driven from the affected portion into the subcutaneous or other tissues beyond the borderline. This condition may be caused by the admission of atmospheric air from the outside into the subcutaneous tissues, by means of small wounds in the skin, especially in the neck, wall of the chest, and the head, and gas or air from some of the internal organs by a perforation of their walls, such as the larynx, trachea, œsophagus, the bowels, or stomach. In cases where there are perforating wounds of the chest, wounds of the larynx or windpipe, or from fractures of the ribs, with complicated injuries of the lungs. Emphysema may also occur from gas formed by breaking down the contents of abscesses or hemorrhagic infiltrations. In malignant abscesses, we find the swelling is doughy and painful, the enlargement becomes crackly and septicæmia develops.

6. LYMPHATIC GLANDS

Merzdorf has carried out some thorough investigations concerning the position and sizes of the lymphatic glands of the dog.

According to his classification lymphatic glands are grouped into five main divisions. **A—Lymphatic glands of the head and neck.** 1.

On each side the Lgl. submaxillares s. mandibulares form a bundle of glands 2 to 5, usually 2 to 5.5 cm. long, which lie superficially caudolateral from the processus angularis of the ramus of the lower jaw and are divided by the V. maxillaris externa into a dorsal and ventral position. 2. The Lgl. parotidea is composed of one gland up to 2.5 cm. in length to which, in rare cases, one or two small glands may be joined. The main gland lies caudodorsal from the temporo-maxillary articulation between the throat-edge of the M. masseter and the ramus of the lower jaw on the one side and the oral edge of the parotid gland on the other, partly superficial and partly deep. 3. The Lgl. retropharyngea is composed of one or two glands, in the majority of cases only in the form of an elongated gland, sometimes as long as 8 cm. and lying dorsal along the side wall of the pharynx, directly caudal from the M. digastricus and ventromedial from the free margin of the wing of the atlas. 4. The Lgl. cervicales superficiales on each side of the neck form a group of one to four, usually two, glands which can be as long as 7 cm. and which lie close to the neck from the M. supraspinatus along the lateral superface of the neck. They are only covered by the outer skin, the fascia superficiales colli and the thin superficial neck muscles consisting of the M. trapezius, M. brachiocephalicus and M. omotransversarius. 5. The Lgl. cervicales profundæ but seldom occur, and if they do, they are only very small glands, at the most 0.8 cm. in length. These lie at the cranial end of the thyroid gland upon the first tracheal ring or still upon the musculature of the pharynx (Lgl. cervicales profundæ craniales) or just in front of the entrance into the thoracic cavity along the ventral side of the trachea (Lgl. cervicales profundæ caudales). **B—Lymphatic glands along the shoulder.** 1. The Lgl. axillaris forms a gland about 5 cm. in length, which is always located as high as the shoulder joint along the medial surface from the distal end of the M. teres major and only very rarely occurs double. 2. The Lgl. cubitalis occurs very seldom and if so, lies as a lymphatic gland of one to two cm. in length, dorsal to the elbow-joint on the third rib, inserted between the M. scalenus supracostalis and M. latissimus dorsi. **C.—Lymph glands of the pelvic region.** 1. The Lgl. poplitea consists on each side of a gland that may reach a length of 4.7 cm. and which lies superficially in the hollow of the popliteal space between the M. biceps and M. semitendinosus on the caudal surface of the M. gastrocnemius. 2. The Lgl. inguinales superficiales in the male dog are on each side arranged in a bundle of 1 to 3, usually 1 to 2, lymphatic glands, which in large dogs may reach a length of 6.6 cm. and which lie along the dorsolateral margin of the penis cranially of the spermatic cord. In the bitch the Lgl.

inguinales superficiales (Lgl. supramammarical, udderlymphatics) form one or two lymphatic glands, each of which may be 2 cm. long, and are located 2 to 4 cm. cranially from the os pubis ridge between the ventral abdominal wall on the one side, the uddertissue and skin of the ventral abdominal wall on the other side. **D—Lymph glands of the thoracic wall and thoracic cavity.** 1. The Lgl. thoracis ventralis usually occurs from 1 to 2.2 cm. in length as high up as the second interarticular cartilage next to the body of the sternum on the M. transversus thoracis. 2. The Lgl. mediastinales usually occur only in the precardial mediastinal space, exceptionally also along the margin, cranially to the middle of the mediastinum and are more or less inconstant. The number and size of these lymphatic glands are likewise very variable. Generally 1 to 6 mediastinal lymph glands, each about 4 cm. long, are located to the right and left and lie respectively along the right and left surfaces of the large vascular trunk ending in the precardial thoracic cavity region, and to the right also lying along the trachea and partly shoved in among these organs. 3. The Lgl. bronchioles are usually 4 in number, generally black glands which may grow to be each 4.5 cm. long and which lie in the region of the bifurcation of the trachea. **E—Lymphatic glands of the abdominal and pelvic walls and of the abdominal and pelvic cavities.** 1. The Lgl. iliacæ occur only as Lgl. iliacæ internæ s. mediales (internal iliac lymphglands) and consist of 1 to 3 on each side, usually however only one elongated, flattened gland which may attain a length of 6 cm. and which is usually located to the side of the aorta between the A. circumflexa ilium profunda and the A. iliaca externa. 2. The Lgl. hypogastricæ are divided into a medial and lateral group: the Lgl. hypogastricæ internæ s. mediales and the Lgl. hypogastricæ externæ s. laterales. (a) The Lgl. hypogastricæ internæ s. mediales form a group of lymphatic glands which consists on each side of one gland up to 4 cm. in length and in rare cases of two or three glands. They lie ventrally to the last two lumbar vertebræ in the angle between the A. sacralis media and the A. hypogastrica, that is to say, its branch. (b) The Lgl. hypogastrica externa s. lateralis is rarely present and lies in the form of a gland, 1 cm. in length, on each side of the ventral surface of the end tendon of the M. psoas minor, where this joins the Crista iliopectinea. 3. The Lgl. sacrales do not occur regularly, and are divided into a medial and a lateral group. Each of these subdivisions consists (on each side) of one or two lymphatic glands which lie closely caudal from the body of the last lumbar vertebra between the A. sacralis media and the M. sacrococcygeus ventralis (Lgl. sacrales mediales), or between the M. sacrococcygeus ventralis and M. coccygeus along the medial surface of the M. piriformis (Lgl. sacrales laterales). 4. The Lgl. lumbales vary greatly as to number and location. Fifteen unusually small lymphatic glands have been located lying in the region of the lumbar vertebral column, partly dorsal and ventral from the aorta and V. cava caudalis and partly between and beside these vessels. 5. The Lgl. mesentericæ are found in most variable numbers (10 to 21) and sizes (to 20 cm. in length), single or in groups, between the lamellae of the intestinal mesentery and the great omentum, generally at definite places along the portal vein or its branches. Corresponding to the intestinal segments to which they belong, they can be classified as small-intestinal lymphatic glands (6 to 14) and the large-intestinal lymphatic glands (3 to 8). The former comprise the Lgl. portarum and the lymphatics of the jejunum and ileum. The largest of the Lgl. portarum is often called the Pancreas Aselli. 6. The Lgl. renales lie on each side in the form of one gland (up to 1.2 cm. in length) in the angle between the aorta and A. renalis; in rare cases they do not occur at all.

With regard to the influence of age upon the size of the lymphatic glands Merzdorf ascertained that in general young dogs show a relatively higher lymphatic gland-weight than middle-aged dogs and likewise middle-aged dogs than old dogs, or, in other words, that, comparatively, young dogs have larger lymphatic glands than old dogs; furthermore that very young dogs resemble in general old dogs with regard to their relative lymphatic gland-weight.

Enlarged lymphatic glands are usually located by means of **palpation.** This method is successful first of all with lymphatic glands located near the periphery of the body while those located in the abdominal and pelvic cavity can be palpated from the abdominal wall only partly where there is a decided increase in the size of the glands and in case of emaciated dogs and when the stomach and intestines are as nearly empty as possible. The lymphatic glands in the thoracic cavity could only be ascertained with certainty by means of the Röntgen rays in case of an extreme tubercular degeneration. A swollen condition of lymphatic glands signifies that irritation or infectious matter has been reabsorbed in that part of the body in which the glands are located. The swelling can therefore be noticed in localized diseases only in the neighboring (corresponding, regional) lymph glands as for example in pharyngitis, the submaxillary and retropharyngeal lymph glands would be affected, while in the case of certain generalized diseases (tuberculosis, carcinomatosis, sarcomatosis) and constitutional diseases (leukæmia, pseudo-leukæmia) many or all lymphatic glands of the body are sympathetically affected.

Swollen lymphatic glands resulting from acute inflammation and suppuration, seem warmer, more sensitive to pressure, semi-solid, firm to soft, tense to solid, as well as shiny and smooth on the surface and inclined to suppurate. On the other hand lymphatic glands that are swollen as a result of chronic inflammatory conditions or metastasis in case of malignant growths, are painless, firm, hard, frequently grown together with their surroundings and often uneven and knotty on the surface. In fully developed leukæmia and pseudo-leukæmia, round nodular hard or semi-hard, painless, not sensitive to pressure, easily moved, smooth tumors are found everywhere where the lymphatic glands occur.

The **swelling of lymphatic vessels** can only be determined on the skin of the abdomen and inner surface of the thigh where there is little or no hair. Here they can be recognized in the form of intertwined cords which at times are sensitive to pressure.

6. TEMPERATURE OF THE BODY

The normal temperature of the dog taken at the rectum varies from 37.5° to 39° C.; as a rule, younger animals have a higher temperature than adults. The normal temperature in young animals is generally about 39.2° and 39° in older animals. The vaginal and rectal temperatures are practically the same. The prepuce temperature is about 1.5, and the skin temperature at the warmest places on the body (in axillary space) about 1° lower than the rectal temperature.

The author, after a series of observations covering over a large number of animals, finds the above to be correct and particularly so far as the prepuce, vagina and skin temperature is concerned.

The following averages were obtained from a series of temperatures taken from both normal and feverish animals: 1, in the bitch the average difference between the rectal and vaginal temperatures was about 0.06° and 2°; during œstrum and pregnancy this may be higher; in the male the difference between the rectum and prepuce was 1.43°; some cases when the animal became nervous or excited, when the prepuce temperature was taken and the penis became erected, this increased the temperature up to 40°, so that it will be seen that it is not advisable to take the temperature from the prepuce, as the difference may range from 2 to 3 degrees.

The average difference between the axillary and the rectal temperature is 0.93° and between the inguinal temperature and the rectal is 0.81°. The method for taking these temperatures is as follows: Place the thermometer in the so-called axillary groove (arm-pit) and inguinal groove (the hollow between the thigh and scrotum in males and between the thigh and mammary glands in the bitch), firmly hold the thermometer for five minutes so that the mercury end of the thermometer will be covered by the folds of the skin. Where you have to take the temperature in these two localities, one degree should be added to the thermometer reading. The results in very fat dogs are uncertain. When the temperature during a continued illness is taken repeatedly it should be taken at same point or locality, e. g., vagina, axillary space, etc. As a rule the temperature of the normal animal is higher in the evening, and slightly higher after a hearty meal, violent exercise, lying in the sun or near the fire. On the other hand, a continuous cold outside temperature can produce a drop in the body temperature as much as 0.9° C. The rectal temperature, so-called body temperature, is taken by means of a maximum or clinical thermometer; the thermometer is slightly oiled, or the anus may be oiled. and the thermometer placed as far as possible into the rectum (allowing a small portion of the instrument to protrude to facilitate removal); allow it to remain for at least five minutes. Hard dry pieces of excrement or a highly inflammatory condition of the bowels may prevent the thermometer from giving the exact temperature of the body. It is to be noticed that the thermometer will not register a sufficient increase in temperature if when taking the temperature per rectum. the anus remains open, if shortly before inserting the thermometer the fœces have been evacuated or a cold water infusion has been made and if the rectum is filled with large masses of excrement and the mercury bulb should lie in these. On the other hand, inflammatory conditions of the anus or rectum will cause the thermometer to register a temperature that is too high in comparison with the actual body temperature of the animal. With the existence of any of the above named conditions the insertion of the thermometer into the rectum may be very painful and in case of large tumors in and around the rectum as well as in case of constipation it may even become impossible. In severe cases it is always advisable to take the temperature at least three times daily, morning, noon and in the evening, and care must be taken to carefully note any change in the reading of the thermometer. The temperature must be kept on a temperature chart, and can be watched with a great deal more certainty than trusting to the memory. Any change in the temperature as indicated on the chart, either rise or fall, indicates some change in the animal's condition, and should be considered a symptom.

A—Increased Body Temperature—Fever

As soon as we detect an increase of the temperature of the body above the normal that we know is not due to overheating or too great

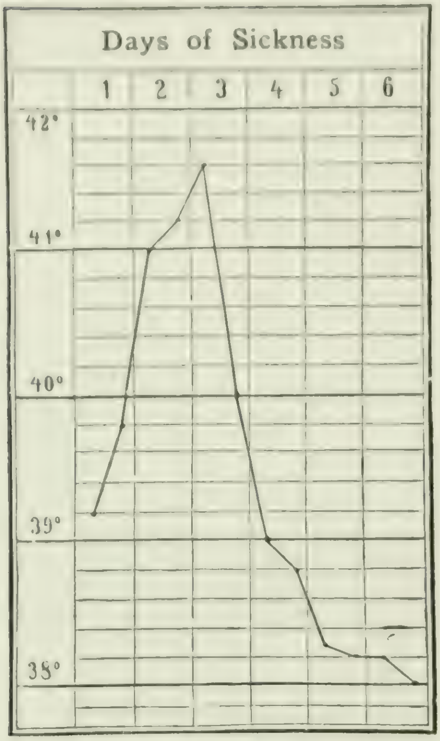


FIG. 3.—Fever curve.

exertion, we define it under the name of fever, and this is referred to in grown dogs of average size as:

Mild fever, when temperature rises to 39.5° C.

Average fever, when temperature is between 39.5° and 40.2° C.

High fever when temperature is between 40.2° and 41.2° C.

Very high fever when temperature rises above 41.5° C.

The above temperature limits in young dogs of the same size are about 39.7°, 40.4° and 41.4° C., respectively, beginning with the mild. For smaller species these temperatures should be increased 1/10 degree and for the larger specie of dogs they are to be reduced 1/10 degree.

The course and severity of a fever are regulated according to the amount and character of the fever-producing substances (pyrogenes), which have penetrated into the blood circulation. In some cases we may have a rapid increase in the temperature (fever-paroxysm); this is often observed in the early stages of distemper or where some tissue has commenced to suppurate. In cases where the temperature remains the same it is called a continuous fever, and if it does not change more than 1° C. it is known as a remittent fever; when the temperature vacillates more than 1° C. without reaching the normal, it is called a remittent fever; but when it is found that it varies greatly, oscillating between a very low, subnormal and a very high abnormal temperature, it is called irregular or atypical fever.

A constant and prolonged high temperature is very rarely seen in the dog. The temperature, as a rule, in early stages of all acute diseases rises very quickly, but it generally falls slowly as the disease advances, notwithstanding the complications, and may reach a normal or frequently a subnormal condition. In cases of septicæmia, which is rather a common disease in the dog, we may see an abrupt lowering of the temperature below the normal and continue so, the animal falling into a state of coma and death follows in a short time.

A fever, as a rule, begins with a chill or a number of them; this is a shivering or quivering of the muscles and skin and finally of the whole body. These chills come on at intervals. The rise in the temperature is not always an accompaniment of the fever, as has been shown in cases of septicæmia; we must, therefore, always take into consideration the other symptoms of fever. These are: shivering, cold, increase in the number of the pulse and respirations; the digestion is immediately impaired and the urine is changed in quantity and composition. All the secretions and excretions are altered from the normal and the nerve-centers show increased irritability. The changes in the pulse and respiration are fully described under the head of Examination of the Circulatory Apparatus. The changes in digestion are seen in the entire loss of appetite, constipation, and increased thirst. The kidneys show the effects of the disturbance by the decrease in the amount of the urine secreted, a much higher specific gravity, and a decreased amount of the chlorids in the urine, an increase in the amount of urates, and a high acid reaction, and frequently the appearance of albumin. In nursing bitches the milk is much lessened in quantity, the skin becomes dry and firm, and the sebaceous glands almost cease secreting. The nerve-centers show the effect by the dulness of the animal and the indifference to surrounding objects or persons, and great restlessness and twitching of the muscles. If the temperature is high, the animal becomes weak and falls away in weight very rapidly.

B—Temperature Below Normal (Subnormal) of the Body

A subnormal temperature is often observed in cases where the crisis or highest temperature has passed and the animal is going on toward recovery or convalescence. In the majority of cases, as the temperature goes down the pulse lessens, the respirations become even and regular, the appetite begins to return, and the animal shows more interest in its surroundings. In collapse there is a rapid fall of temperature, and the heart's action, as shown by the pulse, becomes weak and fluttering and soon imperceptible; the mucous membranes are pale, and the animal weak and even paralyzed. There is also a subnormal temperature in great hemorrhage, in acute and chronic diseases, in icterus gravis (acute congestion of the liver, with yellowness of the mucous membranes, dark discoloration of the urine), in all acute diseases of the brain, in various cases of poisoning, in latter stages of distemper, and in septicæmia, in infectious hemorrhagic gastro-enteritis.

The **temperature of the skin** (external body temperature) during a general examination is considerably less important than the rectal temperature. It is determined or observed by placing the hand on the more sensitive part of the body—the back. The smaller extremities, e. g., ears and feet, are grasped with the hand; they together with the nose (see later: Examination of Respiratory Apparatus) should be given special attention during the examination.

A general increase of the skin temperature is observed during the heat phase of fever and in all diseases that are accompanied by nervous symptoms. An abnormally low skin temperature is observed after severe hemorrhage, in case of marked cardiac weakness, in collapse and in the last stage of dangerous, particularly septic, diseases. An unequal distribution of the skin warmth as well as a sudden change from warm to cold, noticeable particularly in the peripheral parts of the body (see above), can be observed in febrile diseases, heart weakness, anemia and other conditions.

Local increase or decrease of the skin temperature: Locally increased heat of a part is generally due to some injury or some surgical disease, and, is as a rule, accompanied by tenderness to the touch and swelling. A local heat can also be felt in all inflammations that are not located too far from the surface of the body and can for similar reasons be considered as helpful diagnostic means in several internal diseases; e. g., meningitis, pharyngitis, pleurisy, etc. Coldness of any part indicates an impaired circulation in the part. In all cases of collapse the extremities are the first to become cold, because of the impaired action of the heart. In cases of compression of an artery by ligatures, or tumors, pressing on the blood vessels, an embolus, or thrombus, the part of the body that has thus lost its circulation becomes cold from impaired circulation. An œdematous swelling occurring as a result of occlusion of an afferent vessel feels cold to the touch. Paralyzed extremities are always slightly colder to the touch than active parts.

DISEASES OF THE DIGESTIVE APPARATUS

EXAMINATION OF THE DIGESTIVE APPARATUS

In making an examination of the digestive apparatus we have to consider the following points:

The appetite: the desire for food in different animals varies a great deal even in healthy dogs and is also influenced to a large extent by the quality of the food, the way in which it is presented to the animal, as well as psychic influences. The age, the use to which an animal is put, such as a hunting dog or the laboring dog of Belgium and other European countries, the breed; size also has an influence on the amount of food eaten by the animal and the quantity of water it drinks. Some animals have a strong appetite, eat large quantities, digest it well, whereas others are dainty eaters, eat small quantities, and are easily satisfied.

A loss of appetite may result from a number of causes; mainly, from the presence of a fever in the system, by disorder of the stomach and digestive apparatus, lack of food, cold, chilliness, poisons, and in consequence of such diseases as distemper, infectious hemorrhagic gastroenteritis and septicæmia. An abnormal increase of the appetite may be seen in diabetes mellitus and in the presence of intestinal worms. A varying or capricious appetite is often seen with chronic ailments, especially those of the digestive system. A depraved appetite is seen in rabies, when the animal will eat straw, wood, stone, rags, and fœces, but we must also take into consideration the fact that young animals, particularly in puppies, when they are teething, between the ages of four and ten months, will pick up small indigestible objects, such as buttons, pieces of tape, muslin, coal, wood, etc. All dogs, particularly if the stomach is upset, will eat grass, and also in some cases they show a depraved appetite by eating horse droppings or decayed objects, and the well-known habit dogs have of chewing bones. When the animal has great thirst, drinking large quantities of water, it may indicate diabetes insipidus, and mellitus, chronic nephritis, dropsy (ascites), or exudative pleuritis. As a result of acute and prolonged diarrhœa, decayed meat poisoning, catarrh of the stomach and in cases of irritation of the stomach, the animal drinks large quantities of water and immediately vomits it again.

The drinking of unusual large quantities of liquid (cold water) but generally small amounts at a time, is often noticed with feverish animals. The manner in which the animal drinks can be of diagnostic importance in that dogs, whose tongues have more or less lost their power of motion because of inflammation, necrosis, inserted foreign bodies (needles) or paralysis, do not throw the water (liquids) into the mouth cavity in the normal manner with the tongue bent into a spoon shape, but exhibit chewing or snapping motions of the lower jaw when drinking.

In certain diseases, particularly of the mouth and throat, such as irritations of the mucous membrane of the mouth, stomatitis, decayed teeth, tumors or foreign bodies in the cavity of the mouth, ranula, in diseases of the masseter muscle, buccal membrane, maxillo- temporal articulation, the animal is unable to eat large pieces of food, taking only small finely cut-up food or liquids.

Difficulty in swallowing may be present in all the conditions already mentioned and in some cases the animal will drop the food out of the mouth after it has taken it up. Inability to swallow may be seen in inflammation of the pharynx and larynx, in the paralytic stage of rabies, as the result of certain poisons, such as meat poisons, in periods of brain disease, injury to the mouth and throat, tumors or foreign bodies in the throat or larynx, contraction or ossification of the larynx, in tetanus, large swelling in the region of the neck and goiter. Futile mastication is often noticed when foreign bodies are present in the mouth or throat and when teeth are loose or luxated; occasionally also in case of other diseases named above (s. later: Flow of the Saliva). No pathological importance seems to be attached to the occasional occurrence of this condition.

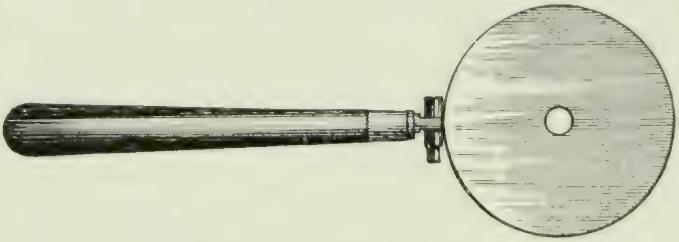


Fig. 4.—Laryngoscope.

Condition of the Mouth and Throat

The examination of these parts requires a good light such as bright daylight, or a clear lamp when the posterior part of the throat as, for example the larynx, has to be examined. This can be accomplished by means of a perforated laryngeal mirror or any reflecting mirror (Fig. 4), or a portable electric lamp (Fig. 5). The best method of opening the mouth with the hands is to grasp the upper jaw with one hand, pressing the cheeks between the teeth, which forces the mouth partially open and prevents the animal from closing the mouth, and with the other hand pull down the lower jaw. Another method to obtain a good view of the interior of the mouth is to put two looped strings or tapes around the lower and upper jaws (Fig. 6); lay the dog on his side or, what is better, directly on his back and throw the light into the cavity of the mouth. The mouth and a large part of the throat can then be easily examined. Leather straps are stronger than tapes but have the disadvantage of producing injuries to the oral mucous membrane. To avoid this a wide tape is to be preferred to a narrow one. In nervous or uneasy animals we can use a speculum (Fig. 7) or a gag if the mouth has to be kept open for some time; it is best to use a gag which can be placed between the teeth on one side, or by means of a wedge-shaped piece of wood. In certain operations of the anterior part of oral cavity and teeth an iron bar wrapped with string held in place by means of a chain is used (Fig. 10). In emergency a round wooden stick can be substituted. When the deeper portions of the mouth and throat are to be examined the mouth is opened, and by means of the finger, a spatula, or the handle of a spoon, the tongue is depressed. A good view of the posterior of the throat can be obtained by grasping the tongue with a dry cloth and pulling it forward or using a forceps which, however, is less desirable. It is then frequently possible to actually examine a part of the interior of the larynx.

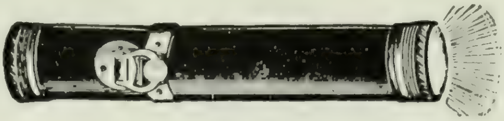


FIG. 5.—Pocket electric light.

In cases where the mouth remains partially open, the animal being unable to close it, we must examine it very carefully, as it may be a symptom of the final stage of rabies; of some brain disease; secondary stages of distemper; in some bacterial poisons, severe injury of the mouth or in fracture or dislocation of one or both maxillary joints, or after crushing large tubular bones. The mouth may also remain open after it has been held open by force for a long time as for operations in the mouth or throat cavity. It may also be due to some foreign bodies located between the teeth or some strain of the articulation of the inferior maxillary. In paralysis of the jaw, the mouth can be closed by putting a stick under the jaw and lifting it; this cannot be done in cases of luxation of the articulation, abscesses or where there is some

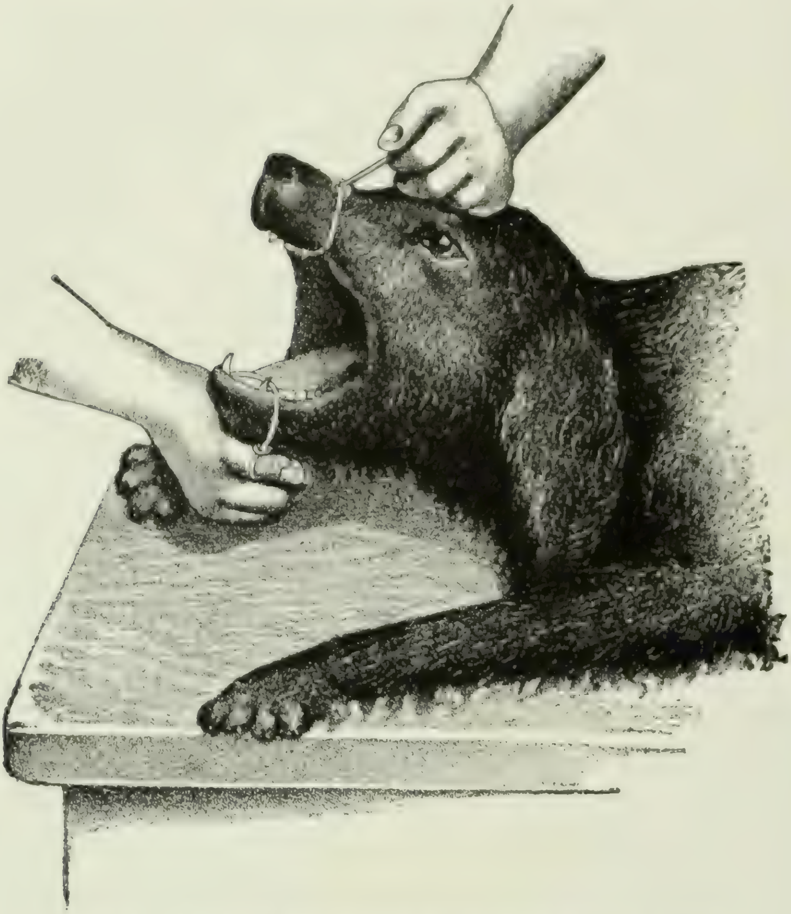


FIG. 6.—Holding the mouth open with looped tapes.

foreign body between the teeth, such as bones or pieces of wood. In case of injuries in the oral cavity the noticeable manifestations allow the diagnosis to be established. The mouth cannot be opened completely in trismus (tetanus) or in partial ankylosis of the articulation; the introduction of the speculum being very painful in some conditions of the mouth (e. g., toothache), in injuries of the various masticating muscles, disease of the articulation of the jaw and infectious hemorrhagic gastroenteritis. If the speculum is introduced frequently, the mouth may remain partially open.

Incomplete closure of the lips, aside from certain surgical procedures on the lips themselves, is to be traced to abscesses in the region of the incisors (gingivitis, osteosarcoma, etc.); however it can be congenital or be induced through rickets. A crooked position of the mouth is observed in unilateral facial paralysis beside other characteristic symptoms. On opening the mouth, if there is a very offensive odor coming from it, it indicates either an ulceration of the mouth, due to ulcerative stomatitis, which has erroneously been called scurvy, diseases of the teeth and in certain diseases of the stomach, in dyspepsia, fœtid bronchitis, or in gangrene of the lungs; it is frequently noticed in animals which are very sick, where the mouth is filled with unhealthy mucus or where particles of food lie in the mouth or throat. In infectious hemorrhagic gastro-enteritis, a very offensive odor is noticed. In cases of poisoning by phosphorus or prussic acid, the odor of the drug is frequently detected in the breath. Incomplete development of the incisors (defective enamel, etc.) occurs in rachitic dogs as well as exhaustive diseases experienced in early life, e. g., distemper; it can be due to other causes, e. g., unnatural diet and poor physical development. On examining the teeth and gums we may see large ossific deposits of the alveolar process, tartar development and caries on the incisors of young dogs and on the molars of old ones and dental alveolar periostitis, causing separation of the gums and loosening of the teeth, particularly in old dogs. An intensely inflamed state of the gums, where they are bleeding and ulcerated, indicates ulcerative stomatitis, mercurial poisoning, or scurvy, and more or less in certain infectious diseases, e. g., distemper and canine typhus; very often tumors (epulides) are found on the inner border of the incisors and interfere more or less with eating. These are usually looked upon as sarcomas, less often as carcinomas, and have the tendency to involve the periosteum or even bone. Very frequently foreign bodies lie between the teeth, causing increased flow of saliva, and sometimes more or less violent symptoms of excitement.

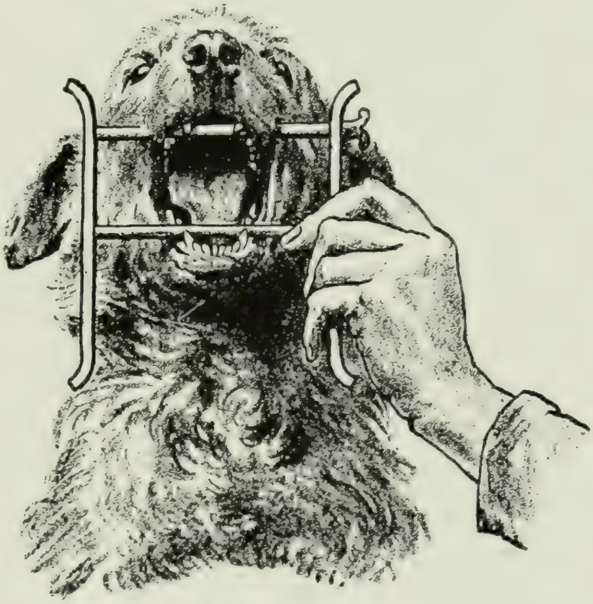


FIG. 7.—Mouth speculum.

A local swelling of the jaw bone can be caused by alveolar periostitis, tumors, abscesses or rickets. The cutting of the milk (temporary) teeth and a change of dentition (cutting of the permanent teeth) may cause intense inflammation of the entire mouth, and occasionally cramps. The so-called double set of teeth occurring in small dogs due to the temporary incisors and tusks remaining and the permanent teeth coming in can lead to foetor ex ore and difficulty in mastication; dental fistulæ usually develop from the upper molars, discharge in the vicinity of the medial (internal) canthus of the eye and somewhat resemble tear-fistulæ. The exact situation can be determined through probing. The tongue is examined; it may appear dry, paralyzed, and in some cases shrunken and lie on the floor of the cavity of the mouth; from paralysis of the tongue as a result of distemper, disease of the brain, or infectious hemorrhagic gastro-enteritis. The author has noticed in paralysis of the tongue a peculiar twitching. I have never yet noticed that the tongue actually hangs out (tongue protruding) in genuine paralysis of the tongue, but this symptom does appear if at the same time, as for example in the final stage of rabies, paralysis of the lower jaw occurs, namely, when the mouth remains open. Furthermore the tongue may, in rare instances, protrude from the mouth in case of severe glossitis as well as in other inflammatory conditions and abscesses. The so-called "tongue-bleating" (leaving tongue hang out), which is seen for example in pugs and King Charles dogs, is a bad habit which has nothing to do with paralysis of the tongue. The tongue may be greatly swollen and enlarged in acute inflammation of the mouth, or from parenchymatous inflammation of the tongue, or from new formations in the tongue. Foreign bodies, such as needles or sharp objects, may penetrate the tongue by getting into the mouth through food or in some other manner. Also the aorta, trachea rings, etc.) may slip over the tongue and constrict a more or less large part of it (s. under-tongue gangrene). Sometimes closed circular bodies (loops of thread, rubber rings, cross sections of

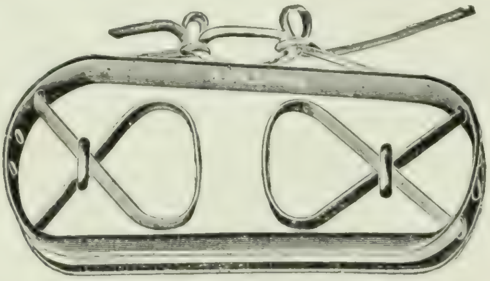


FIG. 8.—Mouth speculum (Mellinger's).

wounds and scars may be noticed on the edges of the tongue in dogs suffering from paralysis of the masseter muscle and by biting the tongue when the animal is in a convulsion. The color of the tongue is a deeper red from inflamed conditions of the tongue, and certain heart affections (at the same time the tongue is more or less swollen; during the fever it is noticeably dry), and with certain heart affections, extreme heart weakness, and when in danger of suffocation the tongue is also cyanotic (reddish-blue color). The tongue is coated as a result of most fevers, but it is also observed in animals which are perfectly healthy. A heavy coating of the tongue is especially noticed in stomatitis, gastric catarrh, and in severe internal diseases; also in acute cases of distemper. In infectious hemorrhagic gastro-enteritis (Stuttgart's disease), the tongue is usually covered with a dirty-brown coating, and sometimes lies paralyzed on the floor of the mouth cavity. In gangrene of the tongue that organ is swollen bluish-gray. The tip of the tongue may sometimes be bluish-black, caused by being bitten or being maliciously tied with a string. A bluish-red discoloration around the edge of the tongue may be due to distemper, stomatitis, infectious hemorrhagic gastro-enteritis and various other causes, but may also appear as an independent ailment. An œdematous swelling on or in the region of the lingual frenum is evident with every important case of glossitis and stomatitis but also in case of an injury of that particular region and should therefore remind one to palpate the tongue for foreign bodies (needles). Needles often disclose their presence by the thread which projects at the place of entrance and which then, since it makes the finding of the needle easier, may be torn off without hesitation.

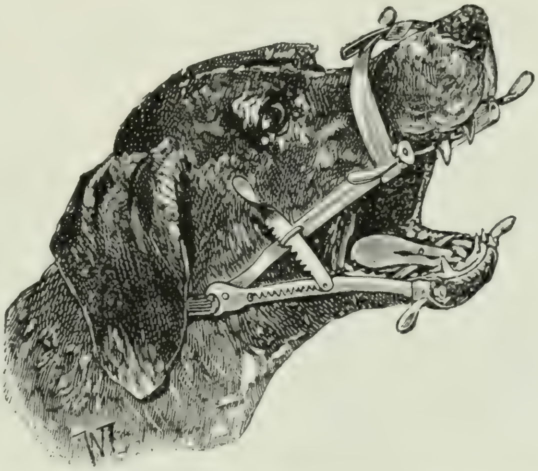


FIG. 9.—Mouth speculum with tongue spatula (after Hoffman).

After administration of violent poisons the mucous membranes of the cheeks and inferior surface of the tongue are found to be gray in color, hanging in shreds, and intensely inflamed, and later abscesses form under those conditions. Furthermore is observed in infectious hemorrhagic gastro-enteritis, stomatitis, and distemper, formation of abscesses on the mucous membrane of the cheeks and as a result of decayed teeth. Ranula appears on the floor of the mouth cavity on one side of the tongue; it is a long or oval swelling, sometimes the size of a goose egg; the sac is a fluctuating swelling with a thin wall, which usually develops from cystoid degeneration of the oral part of the sublingualis, but may have a different origin. Small whitish enlargements resembling warts frequently appear on the mucous membrane of young dogs. They are, however, of little or no importance. In certain sections of southern Europe, where horse leeches occur in brooks and pools, these may be taken in by dogs while drinking and fasten themselves to the mucous membrane of the mouth or pharynx and there cause œdema and inflammation and also vomiting and gagging. A similar case was observed in Dresden in an artificial (blood) leech culture. The salivary glands are frequently swollen and abscesses form in their structure. As a result of these irritations we may have colloid infiltration of the glands, and after inflammation, they become indurated. The secretion of saliva is sometimes greatly increased and runs out of the angles of the mouth in long, thready strings; this is seen in all inflammatory conditions of the mouth or throat or where there are abscesses located in the mouth or throat; during teething; toothache; in cases of mercurial poisoning, and from some caustic poisons, and after the hypodermic injection of pilocarpine; from paralysis of the pharynx, rabies, by cer-

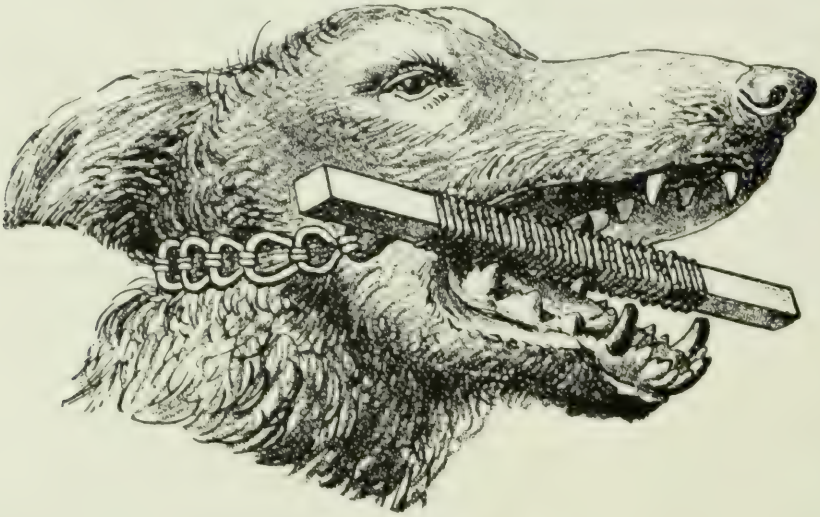


FIG. 10.—Gag.

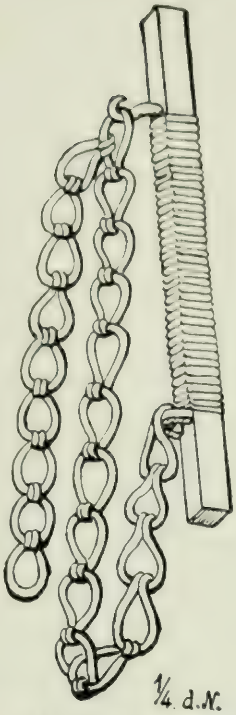


FIG. 11—Locking iron.

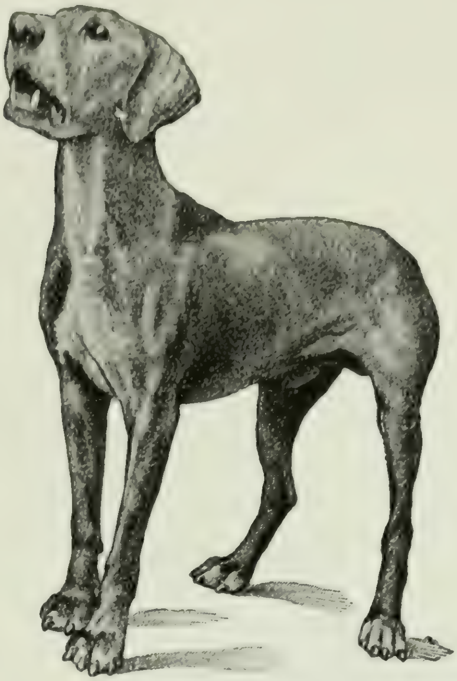


FIG. 12.—Paralysis of lower jaw (rabies suspect).

tain parasites burrowing through the tissues of the body; from spasmodic masticatory convulsions (the saliva is worked into a froth!), sometimes also from stomach trouble and rarely from intestinal worms, etc

The secretion of saliva is lessened especially during all fevers, from the effects of some poisons, diarrhœa, and after the injections of atropia.

The saliva is bloody after injuries of the mouth. It may be slightly stained with blood from stomatitis, scurvy, infectious hemorrhagic gastro-enteritis, and gangrene of the tongue. The soft palate and pharynx are sometimes the seat of acute or chronic inflammations, and sometimes we find abscesses in these parts from the presence of foreign bodies (needles, splinters of bone or wood, tumors). It is well to feel these parts when making an examination. The tonsils are affected apparently secondarily as a rule, in all cases of pharyngitis. They generally protrude from the side of the base of the tongue in dark-red, sausage-like formations. Furthermore, the examination of the pharynx should include palpation of the submaxillary and retropharyngeal lymph glands, which, as has been remarked on page 13, are in all cases of inflammation of the pharynx more or less sympathetically affected.

Condition of the Œsophagus

The œsophagus protrudes from the pharynx on a level with the first cervical vertebra. The anterior part of it lies between the windpipe and the longus colli in the median line of the neck. It extends from there to the left side of the windpipe and passes to the right side of the aortic arch between both membranes of the mediastinum, in the shape of a flat arch, and perforates the diaphragm at the twelfth dorsal vertebra and joins the stomach at the left side. The width of the œsophagus is not regular in its entire length, being narrower at the region of the pharynx and at the cardiac, and just before it unites with the stomach.

The œsophagus is examined externally by the hand (palpation), or internally by the pharyngeal sound or probang, and we may locate traumatisms, tumors, foreign bodies (pieces of bone, wood, large pieces of food) which become lodged in the œsophagus generally just beyond the pharynx in the region of the neck, where they can be easily felt by the hand. The thyroid gland is sometimes enlarged from local inflammation, struma, or carcinoma and care must be taken not to mistake this for a foreign body. Very frequently we find the lymphatics of this region are enlarged. Carcinomas or sarcomas are sometimes found along the course of the œsophagus. The application of Röntgen rays in the œsophagus may, under certain conditions, be of great diagnostic importance. This is done only after the patient has first been given a concentrated dermatol emulsion or has had a pliable lead probang inserted into the œsophagus.

The thyroid gland divides into two lobes (side parts—side halves) which lie along the sides of the beginning of the trachea and are connected with one another by a connecting passage (isthmus) which however is always missing in little dogs and sometimes in medium-sized dogs. In large dogs it is sometimes as wide as 1 cm., 3-5 mm. thick and consists of a glandular tissue. In rare instances it sometimes forms a loop bent outward towards the thorax and reaching down to the entrance of the thoracic cavity (Ellenherger-Baum).

There is as yet no record of a diseased thymus gland whose fore part (neck part) in very young dogs protrudes ventrally from the trachea out of the thorax but which has disappeared entirely after 2 or 3 months.

The introduction of the laryngeal probang is comparatively easy in the dog. The best probang is one less than the size of the little finger and it must not be too flexible; the length should be from 20 to 30 cm.; this size, of course, is for the ordinary sized dog; in very small animals the ordinary sized flexible urethral catheter can be used. Care must be taken to have the probang perfectly smooth and uniform in diameter, and well rounded at the front end. If the probang is very stiff it may be made more flexible by rubbing it briskly with a towel or putting it in warm water for a few seconds, and then moistened or oiled before being used. The **method of introducing the probang** is as follows: The mouth is held open as described on page 20; the head is extended and it is introduced along the upper wall of the throat, keeping it high up so as to avoid the larynx. If the probang should slide into the trachea instead of the œsophagus and cause dyspnœa, the instrument must be instantly withdrawn. This will also be necessary in case of vomiting in order to avoid swallowing the wrong way while gagging usually need not be taken into account. The animal will attempt to swallow it, but that will assist the sounds. It will glide along easily until the obstruction is reached, or glide directly into the stomach. In case a stricture or a foreign body in the œsophagus the probang will come against it, preventing the instrument going any farther. Great care must be taken at this juncture not to push the probang too hard as it may lacerate the walls of the œsophagus, particularly if there is a stricture or a tumor; or if it is a foreign body, it may cause it to become more firmly imbedded or the probang may rupture (perforate) the walls of the œsophagus.

The Condition of the Abdomen

A noticeable increase of the circumference of the abdomen is found in very fat dogs, in pregnant bitches, when the stomach is overloaded with food (see later), in case of an accumulation of fæces in the large intestines, when under certain conditions, especially with animals that have flabby abdominal integuments, the increase in size of the abdomen may become so great that abdominal dropsy may be suspected, in case of a bloated condition of stomach and intestines from gases (tympanitic percussion tone) as is usually evident in the course of stomach and intestinal catarrh and certain poisonings, and also in case of a change in position of the stomach (torsion of the stomach), intestinal stenoses, paralyzed conditions of the intestines, etc. (see also later: Formation of gas in the stomach).

The increase in size of the abdomen also occurs in case of an escape of air from the stomach or intestines into the abdominal cavity (meteorismus peritonei) in conjunction with perforations of these organs by foreign bodies, abscesses, etc., in case of an accumulation of fluids in the free abdominal cavity, e. g., in peritonitis exudativa, after a bursting of the bladder, especially in case of hydrops ascites (a more or less pronounced hanging abdomen, empty percussion tone in the lower sections, horizontal limitation upward, change in position of the fluid when the patient is raised up, etc.), in case of an abnormal stretching of the bladder (bullet shaped, fluctuating swelling, near the bladder, which remains unchanged when the position of the animal is changed), in case of an accumulation of fluid in the uterus, that is to say, hydrometra or pyometra (flabby or firm sack-like mass slightly bent in the direction of the kidneys and not affected by changes in position), in case of large tumors in the abdominal cavity, in case of a decided increase in the size of the liver, spleen or still other abdominal organs. To insure correct diagnosis in diseases, with development of gas or accumulation of fluid, it is advisable to make an exploratory puncture.

A decrease in the size of the abdomen (do not be deceived by peculiarities of breeds) occurs in continued diarrhœa, in case of insufficient nourishment with lack of appetite resulting from various causes, in case of consumptive diseases, etc., also in case of tetanus and early stage of peritonitis, and caused by the convulsive contractions of the abdominal muscles. More onesided protrudings can be caused by a decided swelling of the liver, distended stomach, œdematous swellings, e. g., of the lower parts of the abdomen, tumors of all sorts, abscesses in the abdominal wall, hernias, and numerous other surgical occurrences.

Aside from painful surgical conditions the abdominal wall is sensitive to pressure in diffused peritonitis (especially in the early stage), in carcinomatosis of the abdominal peritoneum, in rheumatic and other painful conditions of the abdominal muscles and in numerous diseases of abdominal organs regarding which information is given in other parts of this book. A noticeable tenseness of the abdominal wall is present in peritonitis, rheumatism of the abdominal muscles, tetanus and in almost all diseases which are associated with an increase in circumference of the abdomen (see above); a decreased tenseness can be recognized in weak, undernourished animals, after profuse diarrhœa and after operative removal of intra-abdominal fluid effusions, especially of dropsical nature.

The exploratory puncture of the abdominal cavity, which has been referred to repeatedly, usually serves the purpose of definitely establishing the presence of fluid in the abdomen or of determining the nature of the fluid whose presence has been already established. The puncture is made with a thin trocar (exploratory trocar) or with a so-called puncture needle. The puncture is best made when the animal is standing or is held in a horizontal position by an assistant; if it must be done with the animal in a recumbent position it is necessary that the animal be turned afterwards so that the site of the puncture be underneath as much as possible. The site of puncture under ordinary conditions is located at the most ventral part of the abdomen, in the region of the umbilicus, as near as possible to the linea alba. On the whole the exploratory puncture, if carried out under aseptic conditions, belongs to the least dangerous operations. Further remarks, especially concerning the examination of the fluid obtained, will be found later under the heading Exploratory Puncture of the Thoracic Cavity as well as in the chapter on abdominal hydropsy.

Condition of the Stomach

Baum, who has made a careful study of the position of the dog's stomach, finds when the stomach is moderately filled with food, its outlines can be easily recognized by palpation (Fig. 13). It lies in the left side of the abdominal cavity, the inferior portion resting on the liver and the anterior portion against the diaphragm, centrally going toward the abdominal wall, but without touching it since between that and the wall lies the left and middle lobe of the liver. This left lobe extends as far as the pelvis, coming close to the left kidney; the left or cardiac end of the stomach extends as far as the ninth rib and posteriorly as far as the thirteenth rib and the anterior border of the left kidney. The right or pyloric end of the stomach is directed on the median line to the right. The larger part of the stomach is enclosed by the liver and the diaphragm coming in contact with the anterior side. The cardiac end of the stomach is directed toward the median line and the pyloric toward the right. The empty stomach (Fig. 14) extends anteriorly as far as the left pillar of the diaphragm and toward the chest as far for-

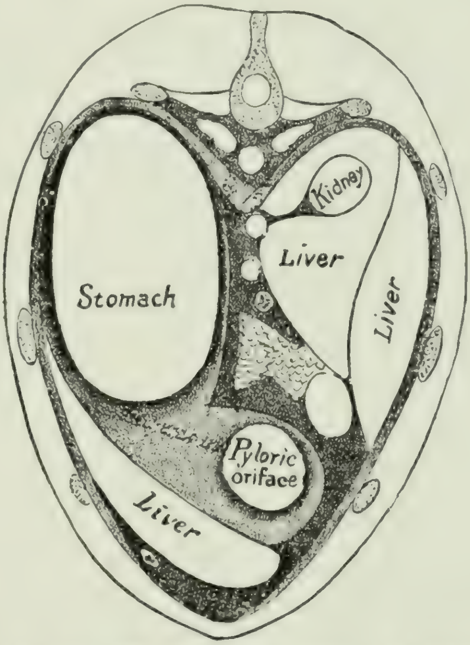


FIG. 13.—Section through centre of abdomen.

ward as the tenth rib and posteriorly as far as the twelfth rib, and is almost completely covered by the liver on the left side. Only a very small part of it comes in contact with the diaphragm and the inferior face of the ninth and tenth dorsal vertebra. The pyloric opening is directed toward the right and very slightly forward (Fig. 15). When the stomach is very much distended with gas or food, it comes almost directly in contact with the abdominal walls, and when greatly distended it extends as far as the umbilical region and lies against the ribs and the left abdominal wall and the left and ventral lobes of the liver being pushed almost entirely away from the surface of the stomach, depending on the amount of the distention.

From the above anatomical details it can be readily seen that it is nearly impossible to make a reliable examination of the stomach when it is empty or even when it is fairly well distended, and that in case of a well-filled stomach the most important parts, the cardiac and pyloric openings, are so deeply seated they are extremely hard to examine. To counteract this trouble as much as possible it is advisable to make the examination of the stomach, especially the palpation of it, after food has been taken, and in case of dogs with no appetite at all and with those that vomit their food immediately after eating, it is advisable to distend the stomach artificially by giving an effervescing powder (best given in a gelatine capsule). Such a distention which, after the insertion of the œsophageal tube, can also be secured by means of a bellows, would also be desirable in case of an examintion of the stomach with Röntgen rays to locate foreign bodies or a pyloric stenosis. In the latter case a dermatol emulsion should first be given. To make a manual examination of the stomach, the animal is best placed in a standing position or sitting in the favorite position of the dog, that is, resting on the hind legs, but may under certain conditions be placed on its side or back. The finger is pressed into the abdomen back of the xiphoid cartilage or on the right side beneath the cartilaginous ends of the ribs; The digital pressure at first may be gentle, with a gradual increase but never with a jerking or pinching or squeezing pressure, for this can be increased until the stomach is outlined. The palpation may be carried out by sudden pressure if a large accumulation of fluid in the stomach is suspected and which would then be detected by fluctuation or a splashing sound (see later). Also to determine pain on pressure (see later) it may sometimes be necessary to palpate with gentle pressure.

When a very careful examination has to be made to detect the presence of foreign bodies or tumors in the stomach, the author proceeds in the following manner: Place the dog on his back and if difficult to handle, or vicious, narcotize it, and press the fingers on the abdominal walls towards the region of the stomach; at the same time an assistant can bring the front and hind legs together, bending the spine as much as possible. This position relaxes the abdominal muscles and the stomach can be easily outlined and its size felt. During such an examination it is most important to watch for the size and fullness of the stomach, for tumors in the stomach wall, for foreign bodies in the stomach and for pressure-pain. A distended or engorged stomach can be recognized by palpation or even by inspection when the abdominal walls bulge the umbilical region and extending under the left false ribs and in severer cases also in the region of the right false ribs, and when most serious by a bulging of the entire abdomen. If the distention is due to gas it can easily be recognized by the tympanitic sound on percussion; if the distention is due to the presence of some fluid it will be indicated by fluctuation. Great distention of the stomach by gas is found as a result of certain poisons, stenosis of the bowels and in alteration of the normal position of the stomach. Moderate accumulation of gas occurs in the stomach in gastric catarrh, but it may also be present in an entirely healthy stomach after the consumption of food that bloats and in that case is usually of no great importance. In general the contents of the stomach may feel soft or doughy but decided variations may occur, according to the quality of the food, and how it was prepared, when eaten. The normal condition of the stomach after eating is that of slight distention but there is no doubt that in case of "heavy

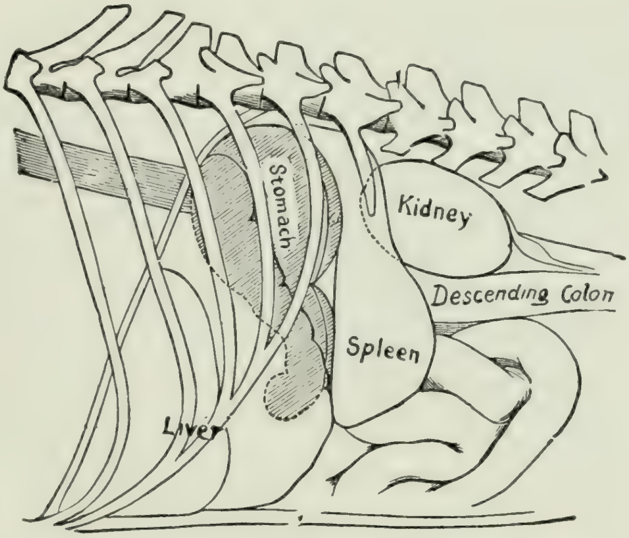


FIG.—14.—Position of stomach when empty.

eaters," especially among dogs which continually receive much bulky food, poor in food properties, the stomach under certain conditions distends to an unusual size which sooner or later is bound to disturb the functions of the stomach and which can be compared to the primary idiopathic enlargement of the stomach of humans. Pyloric stenosis may also cause distention of the stomach. Tumors on the wall of the stomach are extremely difficult to diagnose, and can seldom be determined with any certainty by "deep" palpation. Foreign bodies of moderate size and of peculiar shape can be felt much more frequently, especially with smaller dogs, in the stomach by manipulation. Certain foreign bodies, such as needles, stones, etc., can be detected in the stomach by means of Röntgen or X-rays (see description of foreign bodies in the stomach). Pain on pressure of the stomach may be produced by manipulation, but it is not always present; it may be noticed in acute gastric catarrh, toxic gastritis, infectious hemorrhagic gastro-enteritis, at least so long as stupor or coma does not exist. It must be remembered, however, that it is only the filled or distended stomach that can be felt, due to the lobe of the liver lying between the stomach and the abdominal wall and pain on pressure may indicate some disorder of the liver and not of the stomach. A general hardness of the stomach wall, detected by manipulations of the filled stomach, could be caused by sclerosis of stomach muscles, which as it seems is a rare disease among dogs, and also

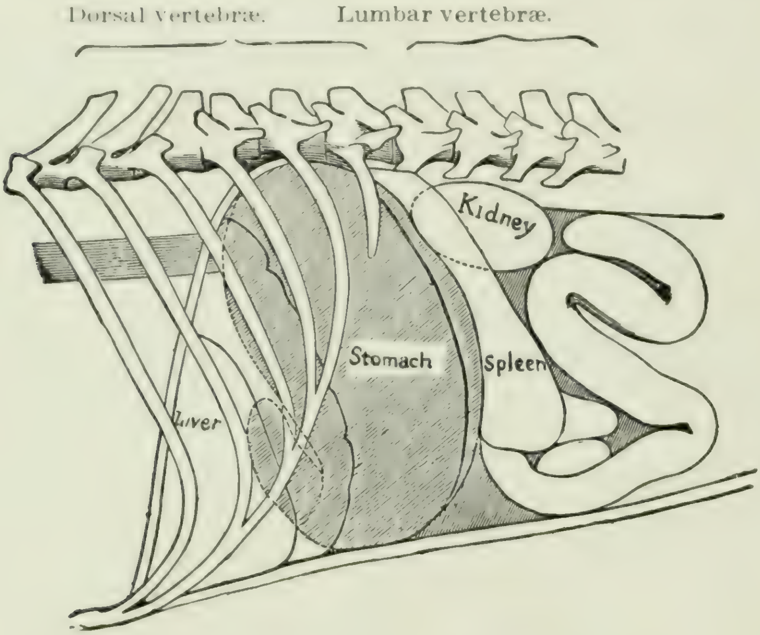


FIG. 15.—Position of stomach when full.

to a certain degree by chronic stomach catarrh. Consequently, in making a diagnosis we must include other observations, particularly an examination of the contents of the stomach.

We can obtain the contents of the stomach either from the substance which the animal may vomit itself or by means of the stomach-pump. This has been recommended by Frick, and only for therapeutic purposes.

The stomach-pump is operated in the following manner: In large dogs an ordinary horse catheter is used and in small dogs a large male human catheter or a small rubber hose. We pass the catheter, as described in the examination of the œsophagus, into the stomach and to the free end of the catheter or rubber hose, which should be about 30 cm. long, we put a small funnel at the other end of the tube (Fig. 16).

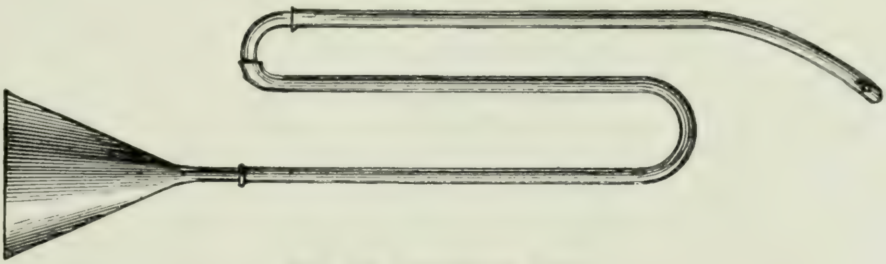


FIG. 16.—Stomach-pump.

Pour a certain amount of water into the stomach through the tube, at the same time holding the tube high, then carefully manipulating the region of the stomach in order to mix the stomach contents with the water; and next depress the tube before the water has entirely flowed off, and the siphon which has been formed will soon empty the stomach of its contents. This method is to be used in very urgent cases where poison is suspected, but as a rule is very hard to do except in very quiet animals and where there is a trained assistant, such as in a hospital; if it is only a question of securing a few drops of stomach fluid contents it is only necessary to insert the tube, then to knead the region of the stomach in order to press a small quantity of the stomach contents into the opening of the tube. In like manner the stomach contents could be drawn out (aspirated) by means of a large-sized Pravaz syringe which must of course fit exactly into the opening of the tube. Yet in private practice the easier way is the better, that is, to administer an emetic. The best means is to give a dose of apomorphia hypodermatically.

℞	Apomorphia hydrochlorate,	0.04
	Aqua destil.,	4.00

Sig.—Ten to twenty drops hypodermatically.

In a few minutes free vomiting occurs and the contents of the stomach can then be examined. Of course, you must take into consideration the time which has elapsed since the animal has taken the food and the character of the alimentary matter. It would be well, therefore, that you know the following facts concerning (Fig. 17) digestion in the dog's stomach:

Digestion of a Meat Diet in the Stomach

After taking an average meal of meat cut in small pieces the digestion in the stomach is very active and free; it begins during the eating and increases until the third hour and slowly decreases until the ninth, and is nearly over at the twelfth hour. After eating a very large meal the digestion is somewhat slower and lasts considerably longer, so that comparatively large remnants of large pieces of meat can be found in the stomach after 12 to 16 hours. The different kinds of meat also vary in the time of their digestion. Pork is the easiest to digest and others are classified in the following order: mutton, veal, beef, and lastly the flesh of older animals (Astley Cooper); skin, tendon, sinew, cartilage, and bones are very hard to digest; the latter are digested from their surface and are reduced as the gelatinous parts are acted upon and dissolved and the lime salts remain unchanged. Fat meat is harder to digest than lean; fat undergoes no change in the stomach, but passes on and is digested in the intestines. Undoubtedly observations have been made in which, in the presence of high fat content of the stomach-ingesta (vomiting bacon), the gall and pancreatic juices, upon opening of the pylorus, poured into the stomach in order to bring about in a

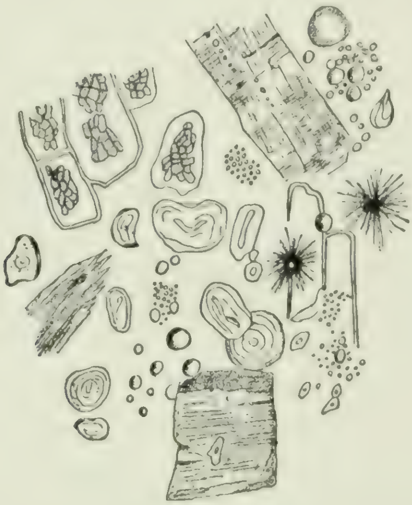


FIG. 17.—Contents of the stomach (four hours after eating): Muscular fibre, starch cells, fat crystals and cells, round cells, epithelium, vegetable cells, fungus.

greater measure the digestion of fat (according to Ellenberger-Scheunert). The gastric juice acts on and reduces roasted meats and if raw meat is chopped up in small pieces the gastric juice acts on it much more quickly. It has never been satisfactorily settled whether raw or cooked meat is easier to digest.

The Digestion of Milk in the Stomach

Milk is comparatively slow in digestion. After an animal had taken 249 grammes of milk he was destroyed four hours later and 13 grammes of cheese and 15 grammes of fluid were found in his stomach.

Action of Digestion on Hydrocarbonaceous Food

Five hours after a meal consisting of rice and potatoes the mass was partly liquefied and softened; the mashed portion of the potatoes had disappeared but the lumps remained. After a meal of rice (of 86 grammes starch) the following observations were made: After one hour 10 per cent was digested, after two hours 25 per cent, after three hours 84 per cent, after four hours 82 per cent, after six hours 90 per cent, after eight hours 99 per cent, and at the end of ten hours it had entirely disappeared (V. Hofmeister).

Both Ellenberger and Hofmeister have come to the conclusion that rice is chiefly digested in the intestines, as there is so much muriatic (hydrochloric) acid in the stomach immediately after eating that saccharation cannot take place; and also that the dog swallows his food with so little mastication that the saliva has no time to make any change in the starch. Furthermore it has been established that the saliva of the dog is very poor in diastatic enzyme.

The effect of the disturbance of gastric secretion on digestion is as follows: When, from any cause, the secretion of gastric juice (subacidity, hypoacidity, hypochlorhydria) is lessened or altered, the following changes are observed: The digestion of albumin, and the antiseptic and antizymotic action of the gastric juice is much lessened, for there is no doubt that gastric juice can destroy the infectious bacteria that are carried into the stomach by the food; consequently, the secretion thus being much less acid, with the lessened digestion of albumen, fermentation is easily started. It is well known that decomposition of meat is lessened by 0.1% hydrochloric acid and prevented by 0.3%. When the gastric secretion is subacid it irritates the mucous membranes of the intestines and lessens the peristaltic action. Subacidity is frequently seen in all anæmic diseases, in fevers, in erosion of the mucous membranes, from the effects of corrosive poisons, in cancer of the stomach, and in chronic catarrh of that organ, in consumptive diseases of all kinds, and in severe gastritis. In one case observed by the author, namely, that of a hunting dog, the entire case of anacidity present could, according to all indications, result only from purely nervousness.

The digestion of starch is impaired by an oversecretion of hydrochloric acid (hyperacidity, superacidity, hyperchlorhydria); this condition, according to the researches of Ellenberger and Hofmeister, is not of great importance, although in many it is frequently seen in ulceration and in acute and chronic catarrh of the stomach, in "nervous dyspepsia," so common in man, but not seeming to occur in the dog, sometimes in carcinoma and other serious stomach diseases.

In testing the contents of the stomach for free hydrochloric acid the best reagent is red paper, phlorogluein-vanillin solution and tropæolin. Moisten a small piece of this paper with a few drops of the filtered fluid-contents of the stomach. If free acid is present the red color of the paper will turn blue. This reaction may also occur if lactic acid is present. This, however, is rarely present in the contents of the stomach. In testing with phlorogluein (vanillin), place a few drops of the following solution in a porcelain bowl, freshly prepared: Phlorogluein 3 parts; vanillin 1 part; alcohol 30 parts; with equal quantity of the filtered fluid of the stomach. Put in a porcelain dish and heat but do not bring to a boil, until it gradually evaporates. If there is free hydrochloric acid present, it will produce a dark red precipitate; if it is present in a small amount, the precipitate will be bright red; if the acid is not present, the precipitate will be brown or reddish-brown. With the tropæolin test the tropæolin paper, which can be prepared by dipping filter paper in an alcoholic solution of tropæolin and then drying, is moistened with the stomach fluid. If hydrochloric acid is present the paper will turn light to dark brown. If methyl-violet solution is used, if a trace of free acid is present, it will color the soluton sky-blue. The test is made in the following manner: Make a certain quantity of the solution, diluting the water until it is light violet. Divide this into equal parts putting into two test-tubes. To one of the tubes add a few drops of the filtered gastric fluid and if any free acid is present, the solution changes to sky blue and by comparison with the other tube the amount of free acid can be approximated, being guided by the change in the color.

Testing with lactic acid is much easier and more certain. The best method is that of Uffelman: 100 grammes of a 2 per cent solution of carbolic acid are to be mixed with one drop of chloride of iron solution, which makes the mixture deep blue; if a few drops of the filtered contents of the stomach are added and muriatic acid only is present, it becomes clear as water; if lactic acid is also present, it becomes greenish-yellow in color.

In some instances testing for pepsin is of importance. The stomach contents, extracted or vomited, are thoroughly mixed with one-half to an equal amount of 0.1-0.2% hydrochloric acid (the amount depends on the consistency of the stomach fluid) and is then filtered. To this filtrate add a small cube of curdled egg albumen and place in a test tube which is then sealed with cotton and placed in an incubator at 38°-40° C. After several hours the piece of albumen can be seen to assume a glassy appearance, that the edges become rounded, etc. If it is desired to obtain results more rapidly a freshly-prepared flake of fibrin can be used in place of the albumen and the test tube placed in a water bath at 40° C. for half an hour. After that the fibrin flake will have dissolved.

In summing up the preceding investigations it is readily seen that the stomach may not be digesting all that the animal eats, but still the animal be in fairly good health; while, of course, it must also be understood that in fevers or any general disturbance, the digestive powers are greatly impaired.

Albumen is almost entirely digested in the intestines, the stomach merely preparing it; fat and starch are digested only in the small intestines; muscular tissue must have a previous preparation in the stomach, or, if it reaches the small intestines without becoming saturated with gastric juice, it is not digested in the intestines. No digestion whatever takes place in the large intestines.

No animal vomits more easily than the dog, and it, as well as only eructation (belching, ructus), may be produced from a number of causes, as a reflex irritation of the stomach, and is noticed in a great many different diseases.

1. By reflex vomiting from the stomach, as in all stomach diseases, irrespective of whether these appear primarily or as a result of other diseases, in case of injury or irritation of the mucous membranes of the stomach by emetics, poisons, splinters of bone, other sharp foreign bodies, parasites, etc., and finally even by overloading. Vomiting frequently is caused by the animal eating grass.

2. By sympathetic irritation from other abdominal organs, intestinal parasites, uræmia, peritonitis, irritation of the intestines, or uterine inflammations.

3. Vomiting may result from serious coughing spells, as a result of laryngitis, bronchitis, or liquids getting into the larynx.

4. In obstruction of the bowels, foreign bodies blocking up the bowel, hernia or twisting of the intestines. In some cases of the latter

condition excrement is vomited. Also vomiting as a result of obstruction or stenosis of the pylorus by foreign bodies or tumors, may be included here.

5. In the early stages of distemper and infectious hemorrhagic gastro-enteritis, persistent vomiting is almost invariably present.

6. From various brain affections (meningitis, commotio cerebri). The uræmic vomiting would also usually be included here. Very often in certain diseases of the pharynx and where foreign bodies have become imbedded or fixed about the root of the tongue, pharynx or œsophagus and in pharyngitis, movements of the throat resembling vomiting are frequently noticed.

The amount of vomited matter depends to a certain extent on the density of the material in the stomach, what it is composed of, and the quantity present in the stomach at the time of the vomiting, and on the severity of the vomiting; that is to say, upon the frequency of its repetition. In cases where the animal vomits, when the stomach is full, the vomited material will either be the food in a uniform pulpy mass, whose appearance will depend on the manner in which the food was taken as well as on the length of time that has elapsed since the food was eaten, or the mass may be largely fluid, with the food lying in it, with little alteration from when it was swallowed. It depends largely on how long it has been in the stomach and whether the stomach has digested it. When an animal vomits when the stomach is empty, there generally is a small quantity of water mixed with the mucus; the color varies greatly according to the circumstances, while, yellowish-gray, yellow or yellowish-green; this latter condition depends on staining from bile pigment. (To test for bile pigment use the Gmelin test, which is described in the chaper on examination of urine.) Continued vomiting of bile may be caused by obstruction (stenosis, invagination) of the duodenum posteriorly to the papilla duodeni; if the region of the papilla itself is involved, then icterus will develop as a result of the obstruction to the outflow of the bile. Other colors may also appear. It may be green from eating grass; violet as a result of licking a wound or eruption that has been treated with pyoktannin. The vomited material may be streaked with traces of blood, due to rupture of some small capillary vessels of the stomach, but this is of no particular importance (see later: Vomiting of Blood). For further particulars see the article on Hæmostases.

The vomited material varies according to the pathological conditions, from a thin watery fluid to thick mucus. In acute or chronic catarrh of the stomach it is often very tough, stringy and glassy, but this condition is also often observed in vomiting from a healthy stomach. The presence of blood in the vomited material may be due to the animal swallowing some sharp foreign body, or by Spiroptera sanguinolenta, the action of some corrosive poison, from infectious hemorrhagic gastro-enteritis, ulceration of the stomach, gastric ulcer, cancer of the stomach, or we may see it in hemorrhage of the mouth, trachea or pharynx, where the animal swallows the blood and vomiting it again may lead to a mistaken diagnosis of infectious hemorrhagic gastro-enteritis. This may also occur when an animal licks a wound, when butcher's dogs devour blood or bloody scraps, and thus swallow a large amount of blood and then vomit it. In hemoptysis (bloody cough from the respiratory organs) it is frothy and a bright color. In hematemesis (vomited blood), the blood is dark, varying from a dark red-brown to a dark brown, sometimes resembling coffee grounds. In rare instances where abscesses form in the pharynx, œsophagus, stomach, or the region adjacent to that organ, when they break they may cause vomiting and the material vomited is stained with blood. Fæcal material is sometimes vomited up in the latter stages of obstruction of the bowels and in acute diffuse peritonitis. Demonstrating the presence of blood in the material vomited is done in the same manner as in urine (see ref.).

Vomited material is generally acid in reaction but it is alkaline in poisoning by alkalies, and in severe hematemesis. It is very important to test the vomited material for free hydrochloric acid concerning which reference has been made previously (p. 38). Vomited material is generally pungent and unpleasant, particularly when there is a collection of fatty acids in the stomach, and very offensive when fæcal material or putrid meat is vomited. This also occurs in rare instances, from violent poisons, and in carcinoma of the stomach, etc. A foul odor may be given to vomited material in cases of injury of the pharynx and œsophagus. But in such cases the material vomited appears entirely undigested, the acid reaction and especially the free hydrochloric acid will be absent. A pungent ammoniacal odor can sometimes be detected in uræmia. In cases of certain poisons, the characteristic odors of the drug can be detected, as in the case of phosphorus, carbolic acid, iodoform, or hydrocyanic acid, creolin, lysol, prussic acid, etc. Internal parasites are frequently found in vomited material. A microscopic examination of the material vomited is only rarely of importance in diagnosis.

Eructation of gas (belching) is frequently seen in perfectly healthy animals, particularly when they rise and stretch themselves. It is also seen in catarrh of the stomach. Yawning is as a rule not to be looked upon as a sign of ill health. It is observed for example in many entirely healthy dogs when they arise and stretch themselves and can be considered as a sign of weariness, sleepiness or ennui. Unusually frequent yawning might perhaps be connected with catarrh of the stomach.

The Condition of the Bowels (Intestines)

Characteristic features of the dog's (see Fig. 18) intestine is its comparative shortness, the very slight differences in diameter of the separate sections, and the occurrence of peculiar glands and sacculations at the anus.

The intestinal tract is about 5 times longer than the body; its length varies according to the size of the dog from 2.26 m. to 7.31 m. and has an average of 4.83 m. The relatively short small intestine can hardly be distinguished by its width from the large intestine which is very short. The duodenum first runs along the liver and pancreas towards the right, dorsally and slightly toward the pelvis to the right abdominal wall; then here as duodenum descendens, in conjunction with the right lobe of the pancreas towards the pelvis as far as the caudal end of the right kidney. Then bending around the cæcum and beginning of the colon, it turns over to the left in the region of the 5th or 6th lumbar vertebra and as the duodenum ascends medial again passes from the left kidney between cæcum and the colon descendens towards the chest until near the pylorus and next to the (cranial) attachment of the mesentery; then it passes ventrally from the colon in the flexura duodenojejunalis into the jejumnum. This terminates in the pelvic region in 6-8 loops, which touch the abdominal wall, or better said, the omentum lying next to this, ventrally and at the side and extend from the stomach to the pelvis. The ileum turns in wide loops towards the chest and passes over, at the height of the 1st to 2nd lumbar vertebra and of the end of the right lobe of the pancreas, with low papillæ into the large intestine along the line of the cæcum to the colon and is fastened near its end to the cæcum by the lig. ileocæcale. The cæcum forms 2-3 loops held together by a small part of the mesentery, and can reach a length of 20 cm. in very large dogs; it lies to the right and dorsal in the region of the 2nd-4th lumbar vertebra; its end is generally turned from the beginning of the ileum towards the pelvis. The colon is short; it begins in the right flank region and as colon ascendens medial it passes from the duodenum and the right side of the pancreas towards the thorax until near the stomach; then turns to the left caudodorsally to the stomach towards the left as the colon transversum passes, as the colon descendens, which lies to the left next to the end of the duodenum and ventromedial from the left kidney, first slightly to the right, then medially directly towards the pelvis ending at the rectum on a level with the 4th caudal vertebra with the anus as the termination. The large intestine has no bands (Ellenberger-Baum). The anus can be divided into 3 zones: the zona cutanea, which forms the transition to the integument or skin in general; the zona intermedia, which is distinguished from the former by a definite line of demarkation and it being smooth, without glands or hair, and th zona columnaris, which is distinguished by large lymphatic nodules and layers of nodes and by submucous so-called anal glands and a large, wide superficial type of swollen body forming a blood sinus. In the zona cutanea we find on each side the opening of an anal sack, the size of a pin head, which represents a sack varying in size from that of a hazelnut to the size of a walnut and surrounded by M. sphincter ani ext. This sack contains a dark gray, smeary, ill-smelling substance and in its walls peculiar knoblike glands, the anal sack glands, which possess a yellowish content. In young, not fully developed animals these anal sacks are smaller and filled only with traces of an almost odorless secretion (Gerstenberger). Caudal from the openings of the anal sacks are located large, alveolar glands, the circum-anal-glands, which open onto the upper surface of the mucous membrane. The zona intermedia is 1-3 mm. wide; the zona columnaris 5-12 mm.; the latter is darker than the rectal mucous membrane and also contains the anal glands mentioned above (Zimmermann-Mladenowitsch).

PHYSICAL EXAMINATION OF THE INTESTINES

The examination of the intestines can either be made through the abdominal wall or the rectum. The situation and size of the various abdominal organs can be seen approximately in Fig. 18.

The manuel examination of the intestines is made in the following way: The animal is put in a standing position and placing one hand on the abdominal wall and the other hand on the other side of the body directly opposite, a steady pressure is brought to bring the hands together and the ends of the fingers are moved from one position to another and thus outline and palpate the different portions of the intestines. If necessary an assistant should induce a relaxation of the abdominal wall by flexion of the hind legs and of the spine. Only in rare instances can it become necessary to undertake the examination with the animal under the influence of a narcotic. While doing this, attention must be paid to see if the animal winces or evinces pain, and whether it is slight or intense. By this means we discover abnormal accumulations of fæcal matter in the large intestines, also whether there are any foreign bodies or tumors in the intestinal wall. Intense pain is shown in the early stages of diffuse peritonitis, and in a milder degree, but still very acute, in toxic enteritis, complete obstruction or stenosis of the bowel, and in infectious hemorrhagic gastro-enteritis. If the bowels are pressed very hard, pain is evinced when there is acute or chronic catarrh of the intestines. A circumscribed or localized pain is seen in intestinal stenosis, invagination, tortion or volvulus of the intestine and from the presence of foreign bodies, fæcal stones, etc.. One must remember in making such an examination that certain painful conditions of the abdominal muscles or even the pain that severe pressure may produce, when the muscles are stretched or compressed, must not be mistaken for intestinal pain. In certain long-standing cases of chronic intestinal catarrh, the writer has found a certain amount of pain on pressing the finger tips between the loops of the intestines.

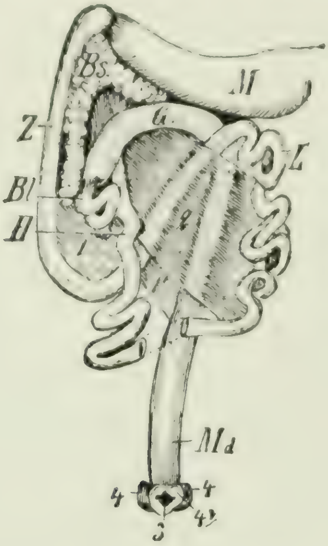


FIG. 18.—Intestinal canal of the dog. *Bl,* Cæcum; *Bs,* pancreas; *G,* colon; *H,* ileum; *L,* jejunum; *M,* stomach; *md,* large intestine; Z, duodenum; 1, curve of the duodenum; 1', flexures of the large intestine; 2, convolutions of the small intestine; 3, anus; 4, 4, anal glands; 4', opening of glands.

Although it is impossible to distinguish the intestinal loops under normal conditions, at the most only as soft, elastic, thin strands in dogs having a flabby and thin abdominal wall the intestinal loops in cases of chronic intestinal catarrh of long standing often can be felt between the fingertips to be coarse strands only slightly or not at all sensitive to touch and are then a very characteristic symptom of the suspected disease.

An increase in the periphery of the abdomen may indicate collections of adipose tissue in the abdomen, pregnancy in bitches, overloading of the stomach with food, or great accumulation of fæces in the large intestines. The same condition is observed from accumulations of gas in the stomach and intestines as a result of catarrh of the stomach and intestines, certain poisons, stenosis of the intestines, peritonitis, paralysis of the intestines, escape of gas from the stomach and intestines into the abdominal cavity (meteorismus peritonis), and also when these organs are punctured by foreign bodies, from accumulations of fluid in the abdominal cavity, in peritonitis exudata, rupture of the bladder, or ascites. Particularly relaxed and flabby abdominal muscles may often make an animal look as if it had dropsy of the abdomen. In great accumulations of urine in the bladder, large tumors or cysts in the abdominal cavity, dropsy of the uterus and in hydronephrosis. Lateral (one-sided) distention of the abdomen may be caused by hypertrophy of the liver, distention of the stomach, various tumors, abscesses of the abdominal walls, herniæ and other surgical diseases. A decrease in the periphery of the abdomen may result from continued diarrhœa, lack of proper or sufficient food, or consumption.

Large accumulations of fæcal matter in the colon and rectum is indicated by a large, knotty, sausage-like mass the consistency of putty and is pitted and often very painful when subjected to pressure. These obstructions cause painful irritation and swelling of the mucous membrane. These swellings are found under the spinal column and extend backward into the pelvic cavity and forward often as far as the colon transversum and beyond. Foreign bodies that have been mixed with the food or if an animal in play catches certain objects in its mouth, such as glass, stones, hard or soft rubber balls, cork, etc., and accidentally swallows them and they become lodged in the intestines, especially if they are coarse and hard, they are easily outlined by palpation by the same means we outline tumors on the abdominal wall when these have reached a certain size. Soft foreign bodies, such as hair balls, overloading of the intestines, or slight invagination are rather hard to diagnose.

Metallic foreign bodies, with less certainty pieces of bone, can be located by means of the Roentgen lighting.

The rather frequent intestinal invagination results in a sausage-like or cylindrical elastic or semi-soft formation which is sensitive when palpated and which can usually be pushed in all directions. An accumulation of gas in a certain section of the intestines could be recognized by the elastic, taut, bloated condition of the intestine.

The rectum is examined in the following manner: The animal is placed either in a standing position or on its side, and the index finger (or in small animals, the little finger), having been dipped in oil, is inserted into the rectum, the other hand being used to hold the tail up or to one side, or to keep the animal quiet. It is frequently necessary to muzzle the animal and in almost all cases an assistant holding the animal greatly facilitates the examination. Very frequently after an examination, the finger is stained with blood, or even blood in larger quantities is observed. This is generally due to the venous engorgement of the rectal mucous membrane and the capillary vessels which are easily ruptured, an injury of the mucous membrane of the rectum by pointed or sharp foreign bodies or by hard, dry pieces of fæces (bony fæces), also from a hemorrhagic proctitus or gastrœnteritis or by a rectal invagination (cf. later: bloody fæces). We examine the rectum when certain symptoms are shown in defecation or the fæces indicate some abnormal condition of the rectum, such as inflammation, abscesses, tumors, or dilation or contraction of that organ. Or we may examine the rectum to remove foreign bodies or particularly hard pieces of fæces or to diagnose abnormal conditions of the neighboring organs, or structures,

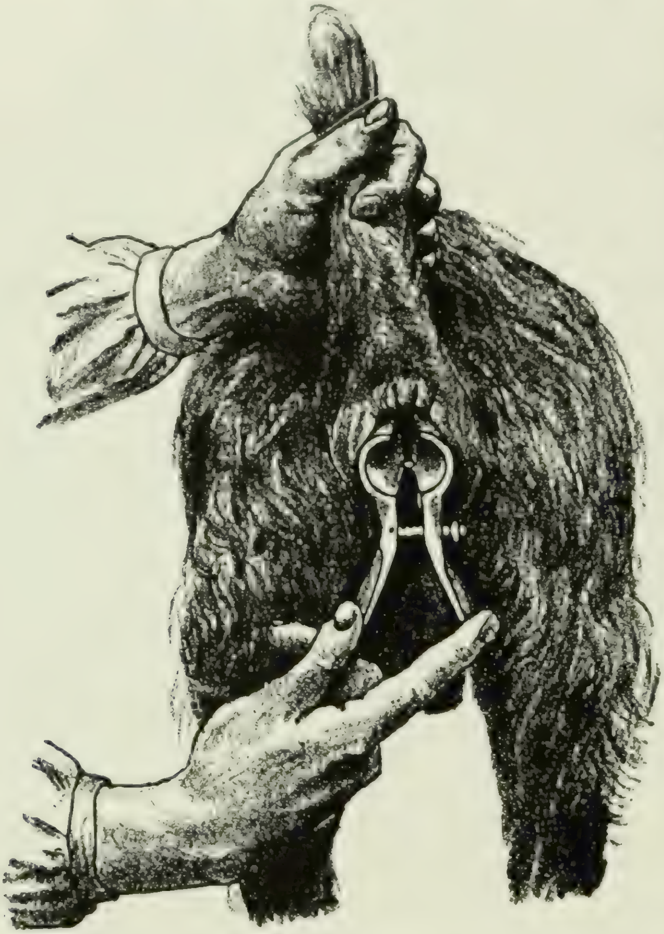


FIG. 19.—Examination of the lower bowel with speculum.

such as the prostrate gland, vagina, uterus, neck of bladder, or if tumors or abscesses are suspected in the pelvis. In very small animals the examination of these organs can be made easier by palpation of the abdominal wall. In smaller dogs a rectal examination is a valuable adjunct to palpating the intestine from the abdomen when it is desired to determine whether foreign bodies, tumors or an invagination exists.

In certain cases where light has to be thrown on the rectal mucous membrane the necessary examination can be made by means of a speculum and then a mirror which, after being well oiled, is inserted into the rectum which, if necessary, should first be rinsed, or an electric torch can be used to throw the light into the cavity. Inflammation of the rectum from any cause, such as hemorrhoids, fistulæ, foreign bodies, or abscesses, can be readily examined by this means. Before beginning the rectal examination the anus and surroundings should be inspected and notice should be taken of any inflamed conditions at the anus or vicinity, e.g. also of inflammation of the circum-anal-glands, also of the nature of fæcal pieces hanging to the anus as well as segments of tape worms, of swellings, of increase or decrease in size of the anal glands, fistulas, etc. It would also be possible at this time to observe prolapse of the rectum perineal hernia and diverticulæ in the rectum (pseudoperineal hernia). A relaxation of the anus or that it actually remains open is occasionally found to ocur after a diarrhœa of long standing, but also as a result of diseases of the spinal chord as well as in severe attacks of unconcousness in some cases of poisoning.

The Fæces

The number of times that an animal has an evacuation of the bowels depends on the two circumstances: The quantity and character of the food and the rapidity with which it passes through the bowels. In addition to this individual conditions and body movements are undoubtedly of importance. Normally, an animal has one or two passages daily; sometimes even less. Diarrhœa, as a result of catarrh of the intestines, may also be due to a variety of other causes, such as irregular diet, cold, or to some infectious hemorrhagic gastro-enteritis, septicæmia, or some irritant in the food; but it may also be caused by a laxative independent of the catarrh.

Constipation is common in all old dogs and in starved animals, in animals weakened from exhausting diseases, in animals that have not had sufficient exercise, or that have been fed with constipating food, in animals suffering from icterus, peritonitis, in the onset of all diseases with rise of temperature, in animals that constantly vomit their food, in the majority of chronic affections of other organs, complete constipation occurs. in all cases of obstruction of the bowels, such as collections of dry fæces in the large intestines, atresia ani, from large collections of internal parasites, tumors in the intestines or adjacent structures, hypertrophy of the prostate gland, too much hair around the anus, swelling of the anal glands, or from tumor of the anus, and also in case of paralysis of the intestine or abdominal muscles, etc. Animals suffering from lumbago frequently do not attempt to defecate on account of the pain evacuation of the bowels causes them.

Constipation alternated with diarrhœa is frequently a symptom of chronic intestinal catarrh—due to twisting of those organs—or invagination, hernia, foreign bodies, loss of the vermicular motion and in all copious exudations from the peritoneum. Pain usually accompanied with oft repeated and prolonged straining during evacuation of the bowels (tenesmus) is seen in inflammation or obstruction of the lower bowels and in inflammation or ulceration of the rectum, or rheumatism of the abdominal muscles, also when splinters of bone or other sharp objects, or very hard pieces of fæces, especially boney fæces (enteroliths, coproliths) are present in the rectum, in case of inflammation of the anal sacs or anal glands, etc. Pain during evacuation of the bowels also occurs with lumbago, painful conditions of the abdominal muscles, peritonitis, a matted, felt-like condition of the hair at the anus and severe obstipation. Involuntary evacuation of the bowels is seen, aside from cases of certain poisonings, in the latter stages of prolonged attacks of diarrhœa, paresis of the cord, and when an animal is dying, from the presence of an abscess, from enlargement of the prostate, from splinters of wood in the lower bowel, or from enlargement of the rectal glands. Furthermore it has also been observed that severe psychic excitement (fear, fright) can result in involuntary evacuation.

The amount of excrement passed by an animal in a given time depends on the quantity and quality of the food that the animal has taken. A vegetable diet produces much more fæces than a meat diet. In an ordinary sized dog fed on bread, the amount of fæces passed daily amounts to 125-400 g. fæces, namely about 20 per cent. of the amount of bread eaten; but if the same animal is put on a meat diet the amount of fæces is 27-40 g., or only about 12 per cent. (Ellenberger). In case of a mixed diet the amount of fæces evacuated daily by medium sized and large dogs is about 50-300 g. In diarrhœa the relative amount is changed, for in this condition the intestinal juices secreted to aid digestion are not reabsorbed, but remain with the fæces and are thrown out. There is an increase in the amount of excrement passed, irrespective of the above mentioned physiological differences.

After an obstinate constipation the amount of fluids is also greatly increased and an enormous amount of excrement is sometimes passed and with it there is also a very offensive odor, due to decomposition of the fæces and to the various excrementary matters that have remained in the bowels. A noticeable decrease in the amount of fæces evacuated occurs not only in constipation but when there is a decreased amount of food consumed and for a short time immediately after severe diarrhœa.

The shape, size and color of the stools are a rather important matter to consider. In normal health they are cylindrical in form, hard or soft, according to the diet; in meat diet they are black or brownish-black and of pitchy, pulpy consistency. The fæces of sucking puppies resemble thick green-pea soup; these are rarely seen as the mother invariably licks them up. Medicine changes the color of the fæces. Calomel and bismuth stains them greenish and iron and bismuth preparations turn them black; on meat and fat mixed they are dark gray-brown, and on bread and milk diet they are yellow-brown or almost clay color. If the animal has eaten much bones, they are whitish, firm, mortar-like, sometimes almost hard as stone. The alimentary matter cannot be distinguished with the naked eye, except in the case of bread, which is passed almost as it is taken into the stomach. Bodies, such as wood, bones, hair, straw, earth, etc., can also be seen in the fæces. Under the microscope (Fig. 20) we can see numerous particles of food that have passed without digesting in animals that have good health. In impaired digestion we see pieces of muscle, connective tissue, etc., with the naked eye.

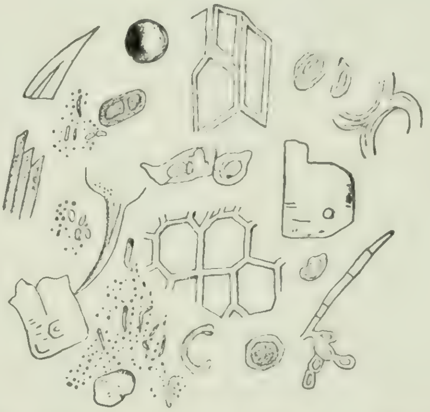


FIG. 20.—Microscopical examination of the fæces. Vegetable matter, starch cells, muscular fibres, epithelial cells, and fungoid growths.

The following deviations in the appearance of the fæces may be observed:

If the fæces contain large quantities of food that is ordinarily very easily digested, or of food that shows little or no evidence of having been digested, disorder of the stomach or intestines is indicated. This condition may also result from fevers, gastro-intestinal catarrh, from increased peristalsis, forcing the food through the intestinal canal before it has had time to digest, from fright, the presence of irritants in the food, from the administration of laxatives or in old (by chronic diseases), exhausted or weakened animals. Fæces containing almost unchanged meat was observed by the author in a dog with complete lack of acidity of the gastric juice; Lienaux saw a similar case in a dog with sclerosis of the stomach muscles. Continuous diarrhœa produces a gall-like, intensely yellow, often a mucous or watery appearance of the fæces. In catarrh of the intestines the fæces contain a large quantity of mucus and have a peculiarly foamy appearance. Grayish-white, or clayey, with a dull gloss because of its rich fat content indicates a plugging of the bile duct or some stoppage of the flow of bile (retentious icterus). The presence of pus indicates the bursting of some suppurative foci into the intestinal tract, especially into the rectum, and to a lesser degree more like "transportation of pus" in case of abscesses or ulceration of the large intestine, or the rectum. Bloody stools (red, brownish red, chocolate colored or black) are frequently passed after a digital examination of the rectum, inserting the thermometer, from injuries to the mucous membrane of the intestine caused by splinters of bone or by other pointed bodies taken in with the food, from certain poisons, so-called hemorrhagic enteritis, from proctitis (inflammation of the rectum), intestinal invagination, etc., in rare instances from distemper, infectious hemorrhagic gastro-enteritis, septicæmia, and in cases of mycotic meat poisoning and related diseases in which case the fæces also generally have a foul smell (see later): Intestinal parasites (Dochmius, Tænia echinococcus) can also cause injury to the mucous membrane of the intestinal tract and produce bloody fæces, which may also result from a hemorrhage of the stomach. Blood may be found on the surface of the stool or mixed with the pus. Which portion of the intestinal tract the blood comes from can be arrived at in the following way: If the blood is found to be mixed all through the material in the fæces it comes from the stomach or small intestines, and the more thoroughly the fæces and blood are mixed the farther from the anus is the source of the blood. But if the blood is in clots or streaks and lying on the surface of the stool, it has come from the lower part of the large intestine or the rectum. The color of the blood is diagnostic; when the blood has escaped into the intestine in the anterior portion, it is dark brown, a greenish-brown, or even black; but from the lower intestines the blood is hardly changed in color and in proctitis the blood is

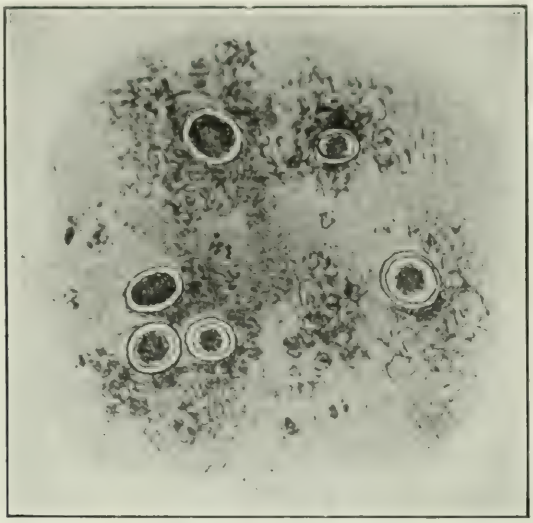


FIG. 21.—Eggs of intestinal parasites in fæces (round worm). Magnified 70 times.

normal in color and is easily detected in the fæces, either in the form of pure blood or blood or pus. Hemorrhoids of the human kind seem to be of very rare occurrence with dogs.

The odor of the fæces is unpleasant, nauseating or offensive, especially when the animal has had a meat diet, and particularly so in cases of long-standing constipation of mycotic meat poisoning, or in the latter stages of septicæmia, occasionally also in diarrhœa or distemper, toxic enteritis, or infectious hemorrhagic gastro-enteritis. Also bile-free fæces (absence or deficiency of bile) in retention icterus have a particularly offensive odor. Flatulence often occurs in healthy dogs and occurs most frequently after the consumption of bloating foods, in case of acute and chronic intestinal catarrh, in icterus and in meat poisoning. Ill-smelling gases (flatus) can also be noticed after administering sulphur, which is practiced by laymen with young dogs.

The presence of the following objects in the fæces may aid in diagnosis by giving an important clue to certain disorders: stones, sand, pieces of bone, straw, grass, splinters of wood, hair, portions of sloughed tissue, mucous coating, particles of pus, etc., also whole or portions of parasites (ascarides, oxyuris, tænia) (Fig. 21), and more minute examination by means of the microscope may determine the nature and some of the above-named objects if they should be in a state of fine division.

In conducting a microscopic examination of the fæces the eggs of intestinal parasites, especially nematodes, tapeworms and dochmius, should first of all be considered of importance. Under normal conditions with a mixed diet it is easy to find pieces of plants, starch granules, particles of muscular fibers with faint cross striations, individual epithelial cells, elastic fibers, etc. Larger quantities of well preserved muscle fibers, pieces of connective tissue or fat indicate insufficient digestion. Larger quantities of fat are also found in the intestines in retardation of the bile or pancreatic juice. Since the dog cannot digest cellulose the appearance of many particles of plant tissue in the fæces is of no importance. Many epithelial cells occur in intestinal catarrh. In addition to these particles of blood, of mucus and pus, fibrous coagulum, etc., may be present. All fæces contain bacteria in great quantity.

The chemical examination of fæces essentially amounts to determining the presence of blood. Usually the guaiacal or benzidin test is used (more detail concerning this appears later: Testing the urine for the presence of blood); however for this test it is necessary that the dog in question be kept on a diet free from meat for several days previous to the test.

To determine the existence of intestinal catarrh (especially in the gastric form of distemper) Jakob recommends the sublimate test: a small quantity of fæces is thoroughly mixed with a concentrated solution of sublimate and is then allowed to stand for several hours; a green discoloration indicates intestinal catarrh.

Condition of the Liver

The liver covers the posterior surface of the diaphragm almost completely and extends as far back on the abdominal wall as the umbilical region. On the right side it extends posteriorly and laterally along the ribs towards the pelvis, on the left side this is true only extremely ventrally; at the right thirteenth rib the liver lies along the right kidney. The gall bladder lies at about the height of the cartilage of the ninth rib but does not extend as far as the ventral abdominal wall.

The physical examination of the liver is very difficult to make. Fortunately, the diseases of the liver in the dog are very rare and can be detected by symptoms other than the direct examination of the gland. The liver is generally examined by percussion and palpation (Fig. 16) since the inspection, the surveying of the region of the liver, even in case of severe swellings of the liver, is often without any results whatever. The percussion area of the liver is where the liver lies against the abdominal wall and the ribs; this takes in on the right side the lower third of the eighth, ninth and tenth ribs and upward and backward over the twelfth and thirteenth ribs, and on the left side the twelfth rib. Under normal conditions a dull, hollow sound is heard on percussion over this region of the liver. The liver, however, even in a healthy condition, may vary a great deal in the different breeds of dogs and also in individual animals. According to Mintzlaff, light weight dogs have relatively heavier livers than heavy dogs and the degree to which the stomach and intestines are filled, especially as to gas content, may exert an influence upon the position of the hollow sound obtained through percussion of the liver. The percussion is best performed with the animal in a sitting position or lying on its side, and in case of large dogs the finger percussion of the hammer pleximeter percussion is preferred.

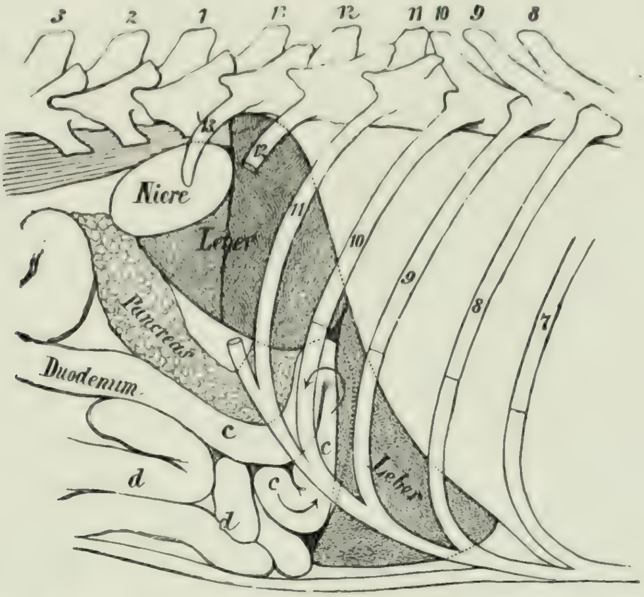


FIG. 22.—Right side of the abdomen, showing the position of the organs.

The liver very frequently is in an abnormal position from various diseases, as a result of exudative pleuritis, emphysema of the lungs, pneumothorax, etc., also when the stomach and intestines are filled with gas from accumulations of fluid in the abdominal cavity. Increase in the size of the liver may indicate tuberculosis—chronic interstitial hepatitis (cirrhosis) in its initial stage; hyperæmia, fatty liver, amyloid degeneration, abscesses, carcinoma, parenchymatous hepatitis, or biliary engorgement. An apparent increase in the dull sound arises from emphysema of the lungs pneumothorax, accumulation of fluid in the thoracic cavity, ulcers of the pleura or lungs; a decrease in percussion sound might occur for example in atrophic cirrhosis of the liver.

The palpation of the liver is made in the following manner: the hand is placed on the chest wall and the thumb extends back of the curvature of the ribs and is pressed in the region of the liver, or the thumb can be placed on the last rib and with the tips of the fingers the region of the liver palpated. The usual position of the animal is to place it on its side. The sitting posture of the animal ought usually to be preferred to the general horizontal one although it may in some instances seem advisable to carry out the palpation with the animal on its side or back. The palpation of the liver is particularly easy in an animal having very flabby abdominal walls or where a collection of fluid, such as ascites, has just been removed. Pain on pressure of the liver is seen in cases of parenchymatous hepatitis, in hyperæmia of the liver, often in case of biliary engorgement, and in early stages of cirrhosis of the liver. In cases of carcinoma of the liver, large, uneven nodules are felt on palpation and in the latter stages of cirrhosis small, uneven nodules are detected on the surface of the liver. The liver is particularly firm and inelastic in cirrhosis, hyperæmia, and biliary engorgement. An increase in the size of the liver can be determined in the diseases previously mentioned under "Increase in the percussion sound." Abscesses may be detected by fluctuation, but only when they have attained a great size, while in cancer the consistency may vary.

The presence of uneven nodules is very pronounced in cases of cancer of the liver which quite often causes an enormous, unevenly noduled increase in the size of the liver and which then results in a noticeable bulging of the region of the liver; sarcoma, on the other hand, present a more even surface. Tuberculosis of the liver presents conditions resembling those of cancer. In case of cirrhosis of the liver palpation will occasionally disclose a noduled surface and an uneven edge, according to the stage of increase or decrease in the size of the liver. The liver is hardest in case of cirrhosis.

The Spleen

The spleen is situated in the left hypochondriac region, is very difficult to examine through the abdominal wall and under normal conditions cannot be palpated at all. Even certain definite medium sized swellings or engorgements of the spleen resulting from various affections of the liver, lungs and heart, from tumors in the region of the porta hepatica, in various infectious diseases, such as distemper, can be determined but very rarely by palpation. When large splenitic tumors are present, in fat animals they are almost impossible to detect; in thin animals they are easily detected by deep palpation of the abdominal walls on the left side. Percussion in such cases can also be made about the last two intercostal spaces at the curvature of the ribs. In determining small swellings of the spleen it is interesting to note that the normal spleen, which is generally described as being tongue shaped, may vary considerably in shape as well as in size and that, according to Mintzlaff, its relative weight varies between 0.08 and 0.377 per cent of the body weight—a considerable variation.

Since, therefore, spleen swellings of small or medium size can but seldom be determined with any certainty by palpation a different result is obtained in case of very large swellings, e.g., those resulting from leukæmia and pseudoleukæmia, in case of tumors (carcinoma, sarcoma) and amyloid degeneration of the spleen.

The Pancreas

The pancreas, on account of its twisted right-angle position and concealed location (it lies as a bifurcated or two-lobed ribbon between the folds of the duodenal mesentery and the great omentum) makes a direct examination almost impossible (Figs. 18 and 22); enlarged pancreas may occur as a result of tumors, carcinoma or adenoma; they may be detected by palpation in the region of the twelfth dorsal to the third lumbar vertebræ, since the swellings thus detected may belong to other organs located near the pancreas. But it is generally unsatisfactory, and a diagnosis is better made of diseases of the pancreas by finding undigested food in the fæces and the presence of sugar in the urine. The very complicated Cammid-reaction recommended for human practice is useless for dogs since it quite often tests positively with absolutely healthy animals.

DISEASES OF MOUTH, TONGUE AND SALIVARY GLANDS

Inflammation of the Mucous Membrane of the Mouth. Stomatitis

Etiology. The most common causes are mechanical, chemical or thermal irritants. Thus, for example, stomatitis catarrhalis may result from injury of the mucous membrane of the mouth from pointed foreign bodies, splinters of bone, etc., from bitten wounds on the tongue, from foreign particles that become lodged between the teeth from where they protrude, also from licking strong medicines applied externally **outwardly,** from the careless administration of too highly concentrated drugs that irritate locally or cauterize, from devouring food that is too hot or too highly seasoned, or that has begun to ferment. Very severe inflammation, which may develop into much more than a case of simple catarrhal stomatitis, is also noticed in case of poisoning strong substances. Catarrh of the mouth is furthermore a condition that regularly accompanies other diseases of the mouth cavity and adjoining regions and is present to a greater or lesser degree as result of severe digestive trouble as well as of acute fevers and many chronic marantic diseases when the mucous membrane of the mouth offers a lessened power of resistance, and the irritating decomposing agents which have formed in the stagnant saliva, in remaining food particles, in the coating of the tongue, etc. (see also Stomatitis ulcerosa), can act. Catarrh of the mouth can be observed as showing physiological evidence in the gums and in connection with the cutting of the teeth and the change of dentition (gingivitis, ulitis).

Clinical Symptoms.—The first symptom the animal will show will be the slow, careful way in which it eats; it will leave any large or hard pieces of food untouched, and swallow small pieces without mastication. At first the mouth feels very warm and then dry, but very soon, at least in severe cases, an increased salivation develops, the saliva is greatly increased in amount and frequently runs out of the corners of the mouth in thin, glass-like, tough, sticky, sometimes discolored threads or strings, while some of the saliva forms in bubbles around the outside of the mouth. On making an examination of the mouth, all of the mucous membranes will be found swollen, red and inflamed and covered more or less with tough, glassy saliva; the gums are especially so during dentition (gingivitis); the inner surface of the cheeks, the tongue and soft palate are also inflamed; as a rule the tongue is coated and covered with thick mucus and saliva. Small, superficial ulcers sometimes, but very rarely, appear in the different parts of the mouth and particularly on the tip and edge of the tongue. These ulcers can no doubt be traced to injuries resulting from awkward mastication.

The duration of the disease depends largely on the causes producing it; as a rule, it is not of much importance and disappears without any medical interference after a few days. In some cases, where it is caused by diseased teeth, it is more obstinate, and if it becomes chronic it is apt to become a case of stomacace.

Therapeutics.—After the removal of the causes the animal should be fed lightly, the principal diet being soup or liquid foods, beef extracts or juice of fresh meats, and be given plenty of fresh water to drink This washes the thick saliva and mucus off the tongue and from between the teeth. Common salt, carbonate of soda, or Carlsbad salts or some such saline waters as Hunyadi, Apenta or Veronica, can be used with good results. In mild cases this treatment is all that is necessary but in severe cases the mouth should be washed out several times a day with any of the following disinfectant and astringent solutions: 1 to 2 per cent. solution of boric acid or potassium chlorate, 0.5-2 per cent. solution of alum or tannic acid, 0.1-0.5 per cent. solution of permanganate of potassium, sol. of peroxide of hydrogen or red wine, salicylic water, vinegar water, a weak solution of alumina combined with acetic acid, or an infusion of sage or wild caraway. Inflamed gums can be rubbed with tincture of myrrh, tincture of catechu, or with a solution of 15 per cent. tannin in glycerine. These same precautions can be used for prophylactic reasons in case of fevers, infectious diseases, cachectic conditions, etc.

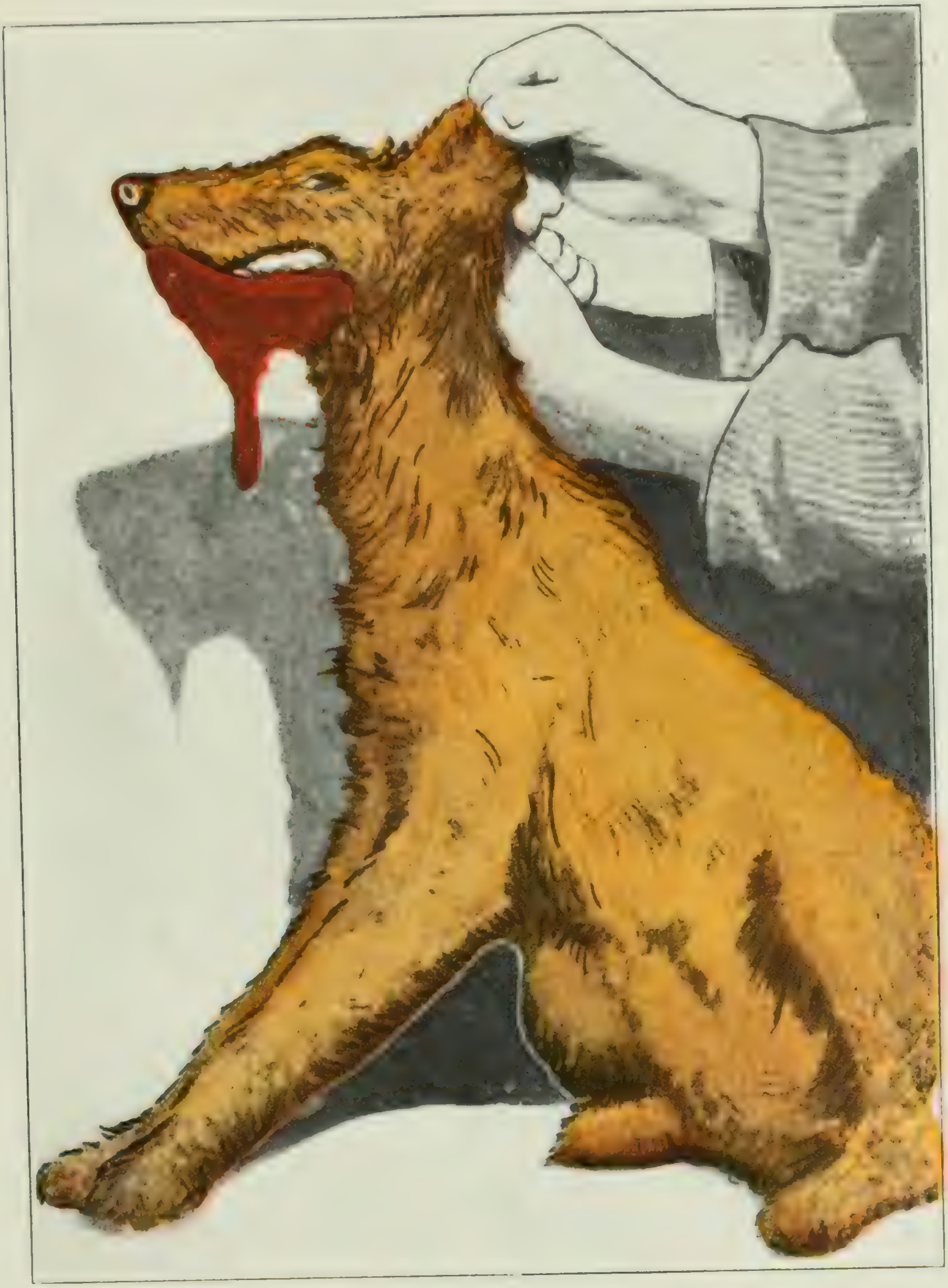
Ulcerous Inflammation of the Mucous Membranes of the Mouth. Ulcerative Stomatitis (Stomacace). Necrotic Stomatitis

Etiology.—This is an inflammation and necrotic ulceration of the mouth and is generally seen in delicate, weak and anæmic house dogs and is associated with the presence of decayed teeth (tartar, caries). It is seen, however, in a small proportion of cases where the teeth are perfectly sound and where the animal seems to be in fairly good health, especially when they are recovering from acute or exhausting diseases. This condition in some cases seems to be due to certain bacterial infection of the mucous membrane and the tissue directly surrounding the teeth or that find the mucous membrane, loosened by diseased teeth or with power of resistance lessened by exhausting diseases, a favorable breeding place. It is still a question whether it is infectious, but if not, it certainly affects a certain number of animals at a time. Ulcerative stomatitis is also seen as a symptom in scurvy, infectious hemorrhagic gastro-enteritis, and in certain cases of poisoning, particularly mercurial. A simple case of stomatitis either from improper treatment or a weak nutritive condition may become an acute case of stomacache.

Clinical Symptoms.—This disease may appear anywhere on the mucous membrane of the mouth but usually begins on the gums. At first the gums are swollen and red in the neighborhood of certain teeth, generally the incisors and tusks but more rarely the molars. The gums are swollen and dark red and painful to the touch and bleed readily. Within a few days the inflamed portion becomes a yellowish green, gray-green, then a dirty brown pulpy tissue. The hemorrhage from the affected parts is constant and ichorous, discolored abscesses form which if not checked quickly increase in size, involving the alveolar processes. This gangrenous inflammation extends and the teeth become very loose and fall out. In extreme cases, the jaw becomes affected and necrosis sets in and large portions of the jaw exfoliate. This condition may also involve the neighboring tissues, often affecting the mucous membrane of the lips and cheeks, the ulcers developing especially on the regions opposite the teeth. As a rule the tongue is rarely affected to any great extent but is, like the other mucous membrane that remains unaffected by the ulcerous necrosis, generally the seat of a simple stomatitis. In all more severe cases of the disease the regional lymphatic glands are sympathetically affected and become inflamed and swollen. The odor of the stomach is very offensive; there is a bad-smelling, sticky, discolored, often bloody saliva running from the corners of the mouth. Generally the appetite is fairly good, although it is very difficult for the animal to masticate or swallow, and bolting the food whole, while affected with this disease, has a tendency to upset the stomach. The general health of the dog is generally disturbed very little and high fever seldom occurs.

A favorable termination of this disease is only to be expected in young, strong, healthy dogs, provided it has not become too far advanced. With proper treatment and favorable conditions the ulcers clean up gradually, and after two weeks they are usually all healed up, healing up from the outer edge inward; but sometimes the fever keeps on increasing and the disease becomes septic in character from absorption of the dead tissues, causing blood-poisoning and collapse, followed by death. The animal may lose its appetite, grow weak, the heart becomes weak and often marked, foul smelling, sometimes bloody diarrhœa occurs. The author has noticed a gangrenous lobular pneumonia from the aspiration of the purulent matter.

Therapeutics.—The animal must be fed liberally, but with easily digested food and soft as possible. All diseased and lose teeth must be removed absolutely without delay thus often checking the spread of the ulcerous process. Remove all the diseased tissues as soon as possible and prevent the spread of the ulcerated portions of the mucous membrane; wash the mouth frequently with deodorizing or antiseptic mouth washes such as have been mentioned in the previous disease, being careful not to let the animal swallow any of the preparations. This is done by holding out the animal's head in such a position during the application of the medicine that the fluid will run out of the mouth. The purulent ulcerations are to be painted with tincture of catechu, tincture of rhatany, tincture of aloes, tincture of myrrh, turpentine, alcoholic solutions of salicylic acid or salol, concentrated solution of alum or tannic acid. A very highly recommended remedy is tincture of iodine; cauterizing with a stick of silver nitrate may also prove beneficial. As soon as the ulcerated surface begins to granulate, milder astringent mouth washes may be used, such as tincture of myrrh, or permanganate



STOMACACE (*necrotic gangrene of the jaw*)

potassium. Syringe the mouth with a solution of tannin and glycerine, 1 to 20. Concerning the methods to be used to combat alarming general symptoms information will be given elsewhere (see, for example, septicæmia) or will be found under the head of that disease.

Foreign Bodies in the Tongue

Foreign bodies, such as pins, needles, fish hooks, etc., frequently find their way into the tongue. It is always well to examine the mouth carefully, when an animal appears to have **ptyalism,** or when it is constantly moving the jaw as if it were chewing, swallowing or making efforts like vomiting or does actually vomit, or where the animal rubs the mouth with the paws, as if to drag something out of the mouth. We may find foreign bodies, sticks, needles, splinters of wood in or under the tongue. It is sometimes very difficult to find a foreign body, particularly when the tongue is greatly swollen and the animal keeps it constantly moving, and at the same time the mouth is filled with thick saliva; too great care cannot be used to detect a foreign body. Go all over the body of the tongue with the finger. The writer has found needles, some of them threaded, mostly at the base, less often on the ventral side of the tongue, and usually the needles were completely reversed, the point being toward the tip of the tongue. In case of doubt it is necessary to use the Röntgen rays. To remove the foreign body, imbedded in the tongue, the free portion of the tongue should be pulled out as far as possible by means of a pair of forceps. In some cases, such as fish hooks, the foreign body should be pulled out in the direction it entered the tongue, so that the barb will not further lacerate the tissues; in cases where the fish hook is ringed in the shank, it must be cut by means of a wire cutter. No treatment is required after the foreign body is successfully removed.

Gangrene of the Tongue

This may occur from bandaging the tongue or from rubber bands put on the tongue, maliciously or otherwise, or if some of the larger blood vessels of the tongue are cut transversely, or from other constrictions previously mentioned in this book. The tongue is greatly swollen and the gangrenous portion is separated from the healthy part by a sharply defined line of demarcation. The gangrenous portion is dark bluish-red, brownish-red, later bluish-gray or bluish-black and covered with more or less pieces of necrosed tissue mixed with thick mucus and saliva. This necrotic portion of the tongue is cold and non-sensitive (see Fig. 23). Great care should be exercised in pulling out the tongue and if feasible should not be done for in some cases if we forcibly pull out the tongue the gangrenous portion becomes detached. Experience, however, shows that the loss of a portion of the tongue, even complete congenital absence of tongue, does not interfere very much with the prehension of the food, since the animal seems to have the ability to adjust itself to the changed conditions. The only evidence is seen in the animal eating and drinking more slowly. Generally these cases heal very rapidly, as soon as the gangrenous portions of the tongue either slough off or are amputated. This conditon is of importance in the prognosis when it is necessary to amputate the dead part of the tongue (at the line of constriction). The foreign body causing the constriction must be removed and in case the tip of the tongue is greatly swollen it may be advisable to scarify later on. It is remarkable that in cases where the tongue is bluish-black and cold, the animal will make a good recovery with little or no treatment other than the removal of the diseased portion. For further treatment see page 56, under Treatment of Inflammation of the Mucous Membrane of the Mouth.

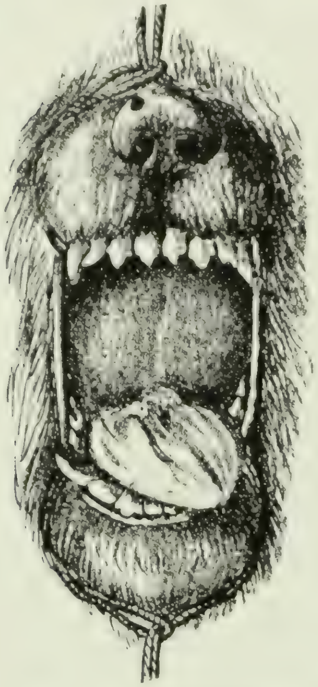


Fig. 23.—Gangrene of the tongue.

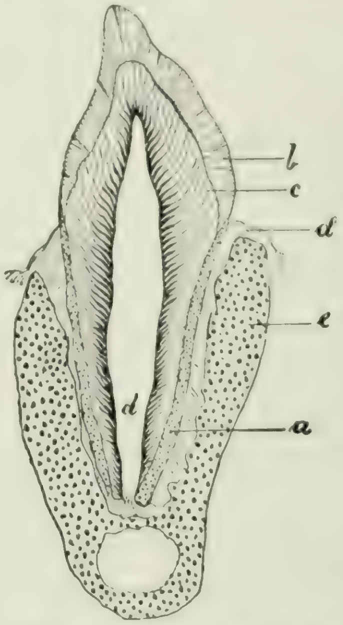


Fig. 24.—Longitudinal section through an incisor tooth; *a*, cement; *b*, enamel; *c*, ivory or dentine; *d*, pulp cavity and alveolar dental membrane; *e*, maxillary bone.

DISEASES OF THE TEETH

Dogs are frequently subject to various dental disorders, such as accumulations of tartar on the teeth, alveolar periostitis; rarely caries of the teeth; and still more rarely fistulæ of the gums.

We understand by tartar of the teeth (sedimentum gingivale, Cremor dentium) a calcareous deposit essentially being precipitations originating in the saliva, and deposited on the neck of the teeth at the border of the gums. These are ill-smelling gray, yellowish-gray, or greenish-gray and sandy or chalk-like in structure. This tartarous substance is deposited chiefly around the upper canine and incisors, then on the upper molar and premolars, less often on the teeth of the lower jaw; this gradually pushes the gums back and often loosens the tooth, which, acting as a foreign body, causes great irritation. Furstenberg found tartar of the teeth of a dog contained calcium carbonate 50.79 per cent, calcium phosphate 41.43 per cent, sodium chlorate 1.02 per cent, potassium sulphate 1.02 per cent, mucus and food debris 4.05 per cent, water with traces of magnesium carbonate 2.71 per cent. Wittman found an average from 5 analyses of 8.85% water, 1.75% sodium and potassium chloride, 15.25% organic substances (mucus and food debris), 41.37% calcium phosphate, 31.69% calcium carbonate, 0.30% sulphur (determined as H_2S) and gives as chief causes for the formation of tartar fermented and putrescent saliva, diseased looseness and inflammation of the gums. Since Cremor dentium occurs more frequently with pampered house and lap dogs the conclusion may, according to Wittman, be drawn that the disease is at least promoted to a great extent by the prevailing or exclusive feeding of the dogs with soft foods that incline towards fermentation and decomposition and that do not cause the cleansing rubbing of the teeth during mastication. The tartar may form towards the crown as well as towards the root of the tooth and can, in extreme cases, eventually enclose the tooth in a capsule-like formation. Inflamed swellings, hemorrhages, ulcerous processes on the gums, alveolar periostitis, fistulæ, atrophy of the roots of the teeth and of the alveolar process (processus alveolaris) and "Epulides" (cicatrices) result.

Other deposits on the teeth. In addition to the tartar there are other deposits of practical importance, namely, the so-called "brown deposit" and the deposits that form on the teeth of sick dogs. Waldman has made a closer study of the "brown deposit." Of the 326 dogs examined by him 36.82% showed the brown deposit to be located on the canine teeth (tusks) of the upper jaw and consisting almost entirely of microbes: cocci, rod-shaped bacteria, spirilla. The chemical examination established the presence of all the elements of tartar as well as salicylic acid and iron. The conclusion may be drawn that the brown deposit is of importance in the formation of tartar as in the development of caries. The yellowish, sometimes dirty brown, deposits on the teeth of very sick, inappetent, feverish dogs are of interest because if of long standing, especially in case of young dogs during the change of dentition, the teeth become stained with a yellowish, even brown discoloration which cannot be removed by cleaning nor by scraping. Designating this condition of the teeth as "distemper teeth" is misleading since not only distemper but all other severe protracted diseases are inclined to show this condition. The tartar can generally be removed with little difficulty by scraping it off with a small cup-shaped instrument or a sound with a leaf-like tongue. Some remove it with a hook-shaped pair of pincers. If there is a large quantity of tartar on the teeth, it is best to put the dog under ether and avoid struggling on the part of the animal, and also facilitate the removal of the tartar without injuring the soft structures of the mouth by using scraping, pinching, or chisel-like instruments, as "myrtle-leaf probes," sharp spoons, periosteum scrapers or hooked pincettes. To prevent the tartar from reforming on the surfaces roughened by the scraping the teeth have to be cleaned from time to time with a brush and tooth powder (pumice stone, chalk, charcoal). Lactic acid, recommended by some as a cleansing material for teeth affected with tartar, has only a very mild effect. It is best used if a cloth is moistened with this sour-tasting liquid and the teeth then rubbed with it. The teeth can then be cleaned with such tooth powders as chalk, charcoal, using a tooth brush or a coarse cloth. Albrecht advises in cases of small tartar formation to take a blunt stick, cover the end with a cloth, and dip it in pumice stone or chalk and alcohol and rub on the teeth.

Alveolar Periostitis.—Inflammation of the alveolar periosteum or the so-called alveolar dental membrane in combination with suppurative periostitis alveolaris purulenta (periodentitis purulenta) is a very important disease, as it has a very important bearing on the value of certain breeds, particularly the terrier class. The most common cause of this is the tartar on the teeth and the accompanying gingivitis ulcerosa; it less often results from caries or other conditions (teeth loose from old age, splintering or fracture of the teeth, foreign pointed objects wedging in between the tooth and gum, epulides) which may cause an infection of the alveolar periosteum from the mouth cavity. As a result of the inflammation and suppuration of the periosteum the tooth becomes loose and finally falls out; a dental fistula or one of the gum may also develop. If it affects very young animals, it is apt to destroy portions of the enamel and leave the teeth unsightly and discolored. This condition is very apt to follow diseases of the blood in very young animals, particularly those that are anæmic, have persistent diarrhœa or have distemper at that period when the permanent teeth are just about or are coming through the gums.

Caries of the Teeth.—This condition has been observed by a number of authors (Moller, Hoffman), but is of very rare occurrence. Of the 12,733 dogs that Malze examined for caries 0.12% suffered from the disease and the dogs examined were mostly pampered house dogs, terriers, mongrels, spitz pomeranians, fox terriers, less often St. Bernards and "Pinschers" from 5-10 years of age. In a few cases the milk (deciduous) teeth were involved. Male dogs were afflicted more frequently than bitches. Conditions favorable for the development of dental caries are: General debilitation and systemic diseases, congenital enamel defects, crowded condition or lesions of the teeth.

Caries of the teeth may result from the teeth being broken by animals in play catching hard objects, stones, coal, etc., sharp bodies running into the gums or becoming imbedded between the teeth.

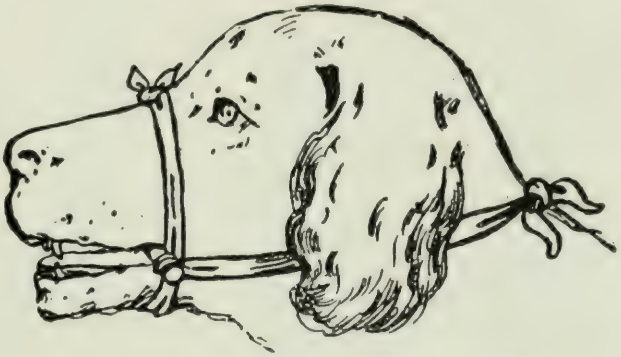


FIG. 24a.—Improvised gag (*French*).

By caries dentium we define an active process of molecular destruction of the enamel and bone of the teeth. This process always begins on the surface and mainly in the cavity of the crown of the tooth forming a rough grayish, then blackish spot. This spot, which is the decayed part of the tooth, advances deeper into the tooth, going on toward the pulp. This penetrates into the tooth until it reaches the nerve, and thus exposes it to the atmosphere, inflames it and makes it very sensitive. Pus formation and suppurative inflammation of the dental pulp with violent toothache occurs. Fractured teeth, fistulæ, alveolar periostitis, stomatitis ulcerosa may also result.

There are certain microbes found in carious teeth, but whether they are directly connected with the decay of the teeth is not definitly known. True dental caries is very rare in the dog. Necrosis of the teeth is frequently mistaken for caries. In old dogs we often see an acute inflammation of the periosteum and the alveolar process becoming inflamed, the tooth is lifted out of its socket, and finally forced out entirely. In these cases the alveolar periosteum is destroyed, and a necrotic conditon of the tooth causes it to become yellow; this is generally termed false caries of the teeth. Alveolar periostitis commences with the formation of an abscess at the root of the tooth, and the pus formed finds its way to the outside of the gums through the alveolar process. It forms a fluctuating swelling on the gums (abscess of the gums); the opening generally remains so, and if it is in the superior maxillary open fistulous tracts may form under the eye just below the lower eyelid, and unless carefully examined may be mistaken for a lachrymal fistula. By means of a flexible probe and an examination of the teeth, the diagnosis can be made with certainty.

In all these cases the animals seem to have a more or less severe toothache; they are irritable, eat very slowly and irregularly, drop more or less saliva, chew with no apparent reason, refuse to have the mouth examined, and, if the affected tooth is struck with something (a key is the best), howl and evince great pain, keeping the mouth open for some time afterward. When the mouth is examined, the gums are swollen, red and painful, the gums are often flabby, and there is a very fœtid unpleasant definite caries' odor from the mouth.

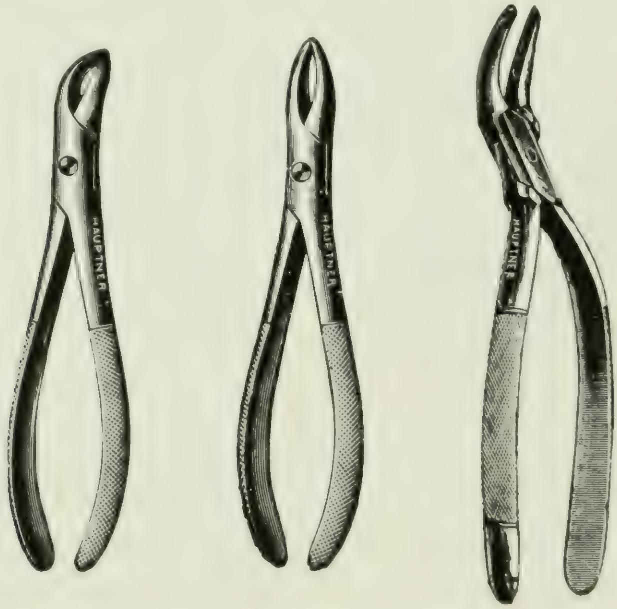


Fig. 25.—Tooth forceps.

When there is more or less pus present, the radical treatment is to remove the offending tooth. The dog is placed upon a table for this purpose and the mouth opened by means of the method described on page 21, using the mouth speculum (Figs. 6, 7, 8, 9, 10), or Fig. 24, which shows a mouth gag that is particularly useful where the incisor or canine teeth are to be examined as it can be easily improvised and allows the mouth to be examined and at the same time the animal does not open the mouth and move the tongue and interfere with the examination and an assistant can hold the head steady and with an ordinary molar-forceps extract the tooth, being careful to avoid breaking the crown. The tooth is seized with the forceps as far down on the root as possible; it is first loosened by twisting it several times from side to side and then drawn out with a strong pull. To prevent the aspiration of blood the head should be lowered immediately after the tooth has been extracted or the operation itself should be performed with the head placed low. Ordinarily the bleeding is of no importance. The mouth must be thoroughly cleansed with warm water and the gums pressed firmly together, so as to keep the cavity, if possible, from filling up with a blood clot. This should be done immediately after extraction. In cases of caries of the teeth, the tooth can be filled by first scraping out the cavity with the dental cutter, then disinfecting the cavity by means of a plug of cotton soaked in creosote, washing it out with alcohol or ether and plugging it with amalgam, cement or gutta-percha, but preferably copper amalgam which, according to Emshoff, possesses the advantages among other things of being used satisfactorily even when saliva is present, of not showing signs of contraction and of exerting an antiseptic action. The material used for filling must be warmed and kneaded in the hand but before filling the tooth the cavity must first be disinfected with a cotton pledget dipped in creosote or liquefied carbolic acid and then dried out with cotton dipped in ether. It is advisable to use the same instruments that dentists use for their human dental work. It takes about 2 hours for the filling to set during which time the animals are allowed to have only water. Hobday has described a case where an artificial tooth has been bridged between two teeth. In the United States this bridge-work and filling is done frequently. Fistulæ of the teeth usually do not heal until the diseased tooth has been removed. Splitting, burning, injection of a solution of silver nitrate or zinc chloride (1:10), creosote or resinous tinctures are almost always of no avail.

Dentition.—Newly born puppies do not have any teeth through the gums. First the temporary canine teeth usually appear about the third or fourth week and the first permanent teeth appear about the fifth month. The temporary canines appear about the fourth or fifth week after the temporary incisors are all in. The permanent teeth begin to come through about the third or fourth month; the lateral and middle incisors appear about the end of five months, and at the same time the second, third, and fourth molars, the fifth molar about five months, the sixth about six months, and finally the seventh about the end of the seventh month, so that the dog has his full masticatory apparatus at the end of seven months.

According to Cornevin and Lesbre the dentition changes in large dogs several weeks sooner than in small breeds; decided differences also occur among the various breeds and according to the diet. Generally speaking, in short-headed dogs the number of molars may be reduced to 4 upper and 5 lower (Hilzheimer). The sharp points of the permanent incisors shown in Ill. 24 wear off in time and according to Cornevin and Lesbre those of the lower molars are worn off by 18 months, of the lower incisors by 2½-3 years, of the upper molars by 3½-4 years, of the upper incisors by 4-5 years and of the upper and lower canines by the 5th year. These notations are unimportant since the rate at which the incisors wear off depends to a great extent upon the consistency of the food, the habits of the dog and also upon the hardness of the teeth.

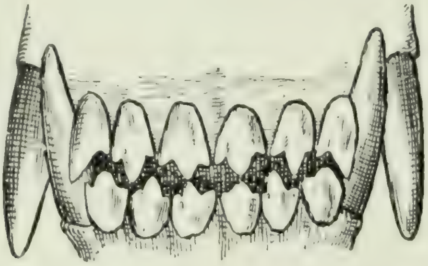


FIG. 26. Incisors and canine teeth of dog one year old.

Change from the normal rotation of temporary to permanent teeth varies; sometimes the permanent teeth will come through the gums and push the temporary teeth to one side, but the latter remain in the jaw. This is particularly noticeable in the very small breeds, and occurs frequently in case of the canine teeth, less often with the incisors but if so, develops the so-called double set of teeth. Sometimes it happens that too many permanent teeth appear, or that the incisors are lacking entirely. The latter condition is apt to occur only in dogs that suffered from severe infectious diseases (see rachitis) in their earliest youth. This is generally avoided by pulling out the temporary incisors as soon as possible. Very frequently this allows the permanent teeth to come through the gums at once and assume their normal position. This irregularity is particularly noticeable when the animals are affected with some acute infectious disease, such as distemper.

During the process of teething, the gums become very red and inflamed, and there is an increased amount of saliva; in some cases the inflammation is intense, with complete loss of appetite. Convulsions may occur from reflex nervous irritation. This nervous irritation may produce a cramp of the lower jaw that is very similar to the paralysis of the jaw in rabies.

These cases are best treated by simple sedatives, and if the gums seem to be tough, they should be lanced with an ordinary gum lancet, and thus assist the tooth to come through to the surface.

Malformations of the Cavity of the Mouth.—Malformations or growths on the buccal membrane are frequently seen in the dog, located about the edge of the gums and on the inner cheek. They are generally classed as epulides. They vary in size from a pin-head to a walnut. They are invariably pedunculated; but sometimes they are seen with an extended base, irregular or smooth on the surface; they are sometimes hard as bone, and may be granular, cleft, in folds, or soft and deep red in color; they may occur in various characters—fibroma, carcinoma, oseomata, or sarcoma. They may have their initial starting point in the gums as well as in the periosteum or bone. The author observed a melanotic sarcoma in one case. These epulides grow sometimes to be very large, even to the size of an apple, causing malformation of the jaw, pushing the teeth to one side, loosening them and eventually causing them to fall out, making mastication very difficult, and

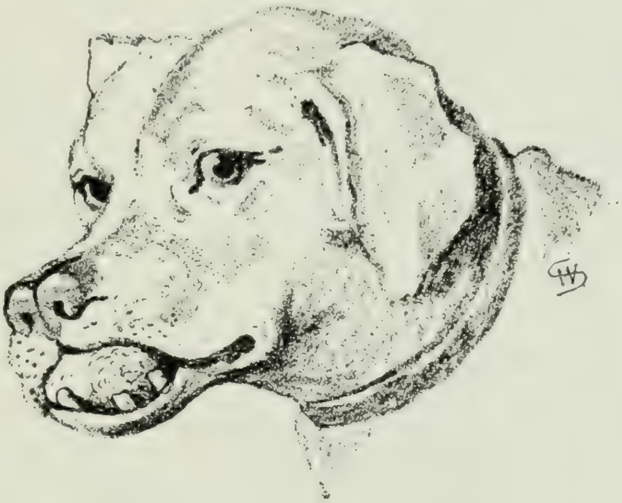


FIG. 27.—Tumors of the gums.

preventing closure of the mouth (see Fig. 27). The prognosis of the malignant epulides, classed with sarcomata and carcinomata, is very doubtful because of the relapses that generally occur and unfavorable in case of severe swelling of the jaw.

These tumors can be removed only by an operation, by ecraseur of wire (Fig. 28), by cutting them out with a probe-pointed bistoury, or

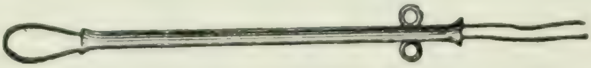


FIG. 28.—Wire écraseur.

by chiseling or sawing off the tumor. The hemorrhage can be checked by the thermo-cautery or by a solution of chloride of iron, but the hemorrhage is generally so slight as not to require any styptic, but in case the hemorrhage is severe and also to remove ends (remnants) of the tumor remaining after the operation is over it is necessary to cauterize thoroughly with the thermo-cautery until a firm deep scab has been formed. Loose teeth, or teeth that are firm but interfere with the removal and eradication of the tumor, should be extracted. If the tumor is firmly attached to the bone or directly in the bone substance itself,

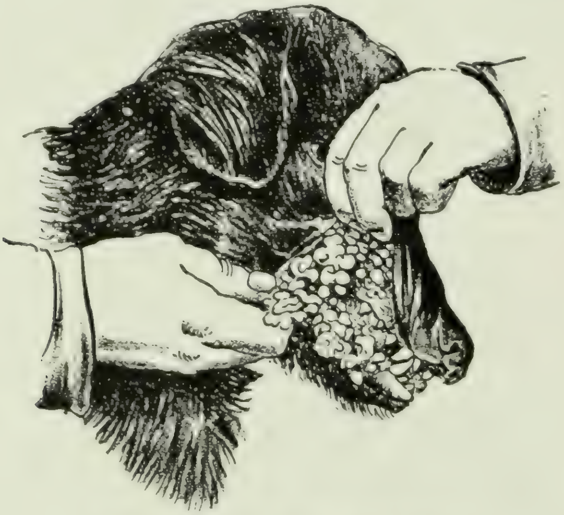


FIG. 29.—Warts of the mouth.

the affected bone should be removed with the knife or bone forceps and scraped with a curette so as to prevent, if possible, the recurrence of the growth; but frequently they return in spite of every precaution.

Warts in the Mouth.—In young dogs, generally under twelve months, we frequently find on the lips, buccal membrane, and under the tongue numbers of papillomæ; these sometimes occur in enormous numbers. These are small, at first whitish-gray, later grayer, pink or pinkish-black, wart-like, fringed, folded or threadlike proliferations (see Fig. 29). These growths are generally of little importance. They may appear in a few days and cover the surface of the mouth and disappear as rapidly as they appear, but are said to be transmissible by contagion. No tretment is regarded necessary unless they are in such masses as to interfere with mastication. If so, remove the largest with a curved pair of scissors and dress the mouth with some astringent wash, and administer liq. potassii arsenatis (Fowler's solution) internally in the food.

Ranula.—Besides these tumors of the membranes of the mouth we find a growth called ranula. It generally occurs under or on the side of the ventral surface of the tongue, is covered with the mucous membrane, and rarely painful to the touch, is smooth, round or thin walled, and more or less cylindrical in shape. Often an animal will become very slow in eating, and if the mouth is examined, we find on one side of the tongue and under it a large-sized body, varying from the size of the little finger to a chicken's egg, a fluctuating swelling, generally reddish-blue in color and when opened with a knife it is found to be filled with a thick, creamy, glue-like liquid. Many theories have been advanced as to the cause of this disease; some consider it to be the formation of an ordinary cyst and others contend it is due to the plugging (swelling shut) of the ducts of one or more of the salivary glands at the base of the tongue. In some cases the cause of the trouble is due to the obstruction of the duct of Wharton, which has its entrance into the mouth at the base of the lingual ligament, and in other cases it is a cystoid degeneration of a few glands at the base of the tongue, probably due to a plugging of the opening of their ducts and a consequent inflammation of the glands themselves. It therefore seems best to call all the cystoid formations under the tongue ranula. It is possible to confuse these with tumors (lipomata) which have formed in the same place (Jacob).

It is as a rule advisable to operate on these cysts; cut down on the cysts with a lancet and make a good-sized opening, and by means of a pair of curved scissors remove a portion of the upper part of the wall and cauterize the inner walls of the cysts with the thermo-cautery or stick of caustic silver, and since draining the cyst by a puncture or small incision would only result in temporary relief, it is advisable to make the incision the entire length of the cyst. If Wharton's duct is involved, be guarded in the cauterization, confining it only to the anterior part of the cyst toward the point of the tongue. If, however, the cyst wall is thoroughly reduced as far as posible then cauterizing the remnants of cyst wall tissue is usually unnecessary. If there is hemorrhage worth mentioning it can be checked easily by applying a solution of iron chloride with a little cotton. Serious results have not been observed. A bloodless method, which may be tried before the operation, consists of using saliva-producing means (pilocarpine). The injection of pilocarpine, which has been used with success in many acording to Soffintini's method, has been tried in animals by Hoffmann. It consists in creating a great amount of the salivary secretion, and the force of the collected fluid from the inside breaks the obstruction of the duct.

DISEASES OF THE SALIVARY GLANDS

Parotitis; Mumps

Inflamed conditions of the salivary glands are generally very rare among dogs. This is especialy true of the sunblingual gland and partly so of the submaxillary gland, while an inflammation of the parotid gland occurs more frequently but still not to any great extent. The orbital glands have as yet apparently never been observed to be affected.

Inflammation of the glands of the ear (parotitis) appears either as a consequence of some mechanical cause, or by infection from the cavity of the mouth, from some existing inflammation of that part, as a disease, due to the presence of a micrococcus which develops in the saliva in the form of a diplostreptococcus or by direct infection from the blood itself in the form of a diplococcus or from metastasis (septicæmia, pyæmia, or, in rare instances, distemper). The latter requires special mention as a primary idiopathic parotitis (mumps), because it occurs over a wide range and sems to be contagious (Busquet and Boudeaud).

Etiology.—This disease is rather rare in the dog, but sometimes it may take the form of an epizoötic (Hertwig, Schussele). In these cases it is probably due to some infecting virus that gets into the gland through Stenson's duct. The exact nature and time of incubation of this disease are not known, but 3-4 days is accepted to be the time of incubation of this primary idiopathic parotitis which may perhaps be compared to the human epidemic parotitis (mumps) which is transmissible to dogs.

Symptoms.—The disease begins with a swelling of the gland and the adjacent structures on one side or both sides of the ear. The location of these glands is seen in Fig. 30. They swell rapidly and are very tender to the touch, changing the whole appearance and position of the head and neck. The animal is very droopy, carries the head and neck in a fixed position, eats with great difficulty, and will swallow only very small pieces. Sometimes a swelling of the submaxillary gland is observed. The saliva is very thick and forms tenacious bubbles at the corners of the mouth. The fever is seldom high, and in the majority of cases in from five to eight days the swelling decreases and disappears entirely in fourteen days (Hertwig).

In rare cases an abscess is formed in the gland (**abscess of the parotid**), a result that seems much commoner in the unilateral secondary parotitis, and invariably in one only. The gland swells as in mumps, only more, is much quicker and surrounding tisues are swollen and œdematous, and generally accompanied by fever. Soon a fluctuating portion is felt, at first in a restricted location, later over a wider area, which later opens in one or more places and a thick, creamy pus escapes; the œdema of the surrounding tissues disappears quickly, and the fever, which is rarely of much consequence, goes down entirely and the wound closes in a short time.

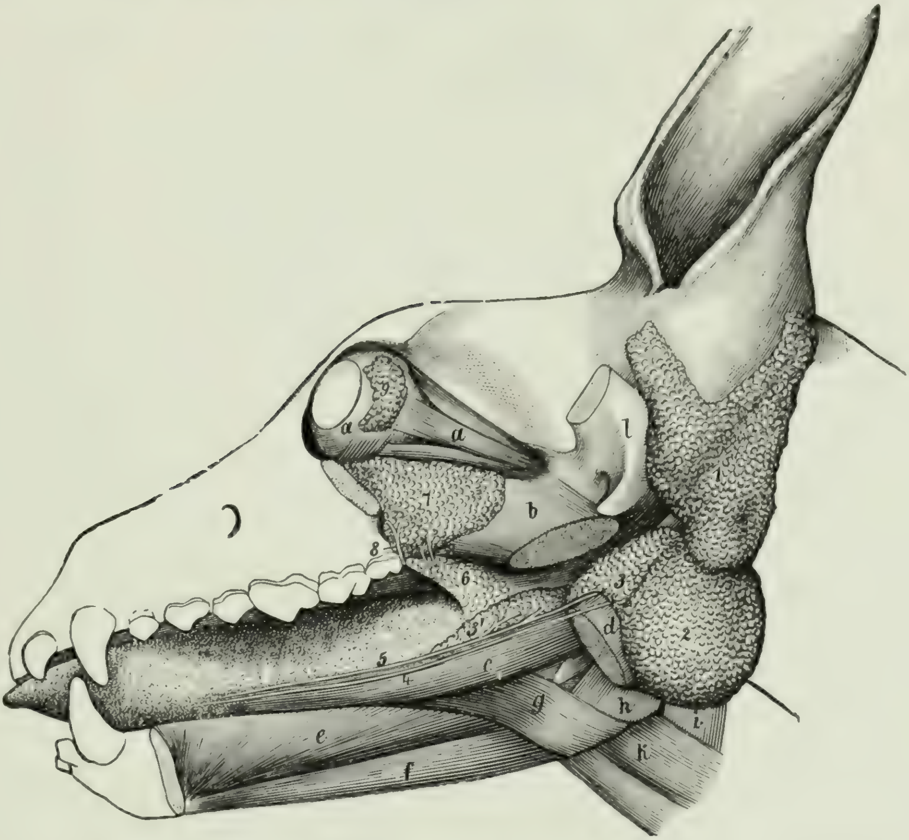


FIG. 30.—Glands of the head: 1, parotid gland; 2, submaxillary gland; 3, subzygomatic gland; 4, Wharton's duct; 5, Bartholin's duct; 6, palatine gland; 7, orbital gland; 8, Nuckian duct; 9, lachrymal gland.

The inflammation of the glands below the tongue and lower jaw generally forms abscesses so far only observed on one side, which open in the mouth, the pus escapes, and the sore heals up in a short time. The submaxillary generally breaks through the skin and the sublingual into the cavity of the mouth. There is never any consequence in any of these cases.

Therapeutics.—In the primary form of parotitis, where we do not have the formation of an abscess, we obtain good results with warm applications (Priessnitz applications). Keep the animals as quiet as possible, and then rub on ointments, such as vaseline and lanoline, or paint with tincture of iodine. In case the inflammation seems stubborn, camphor or iodoform ointment or painting with tincture of iodine may be resorted to.

As soon as we see that the swelling is not going down within a certain time, but increasing gradually, developing into an abscess, we must try to open the abscess as soon as possible and allow the pus to escape, treating according to general directions. If fluctuation can be felt, cut down on that point, but if not, a portion of the skin and fascia have to be carefully cut in the dependent portion, making a good-sized opening. The gland is now exposed, the pus can be detected and opened, a drainage-tube inserted and sewed to the tissues—if not sewed, the animal will shake it out—and cleanse daily with an antiseptic solution. It is better not to bandage the neck, as it interferes with the tube; in some cases it is not necessary to insert the tube, but to clear the opening daily and dilate it, if necessary. These abscesses heal rapidly if there is exit for the pus.

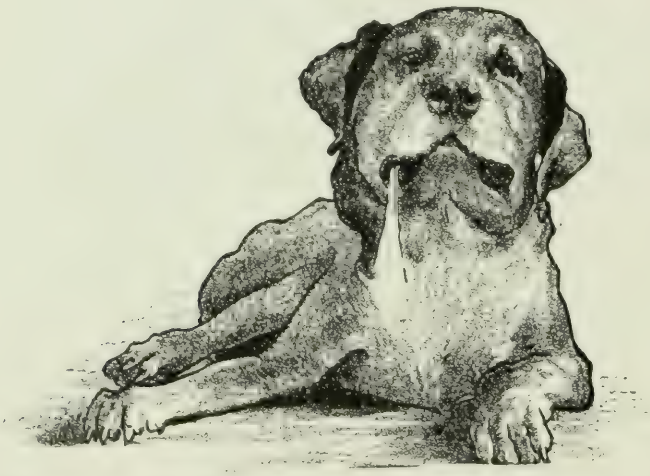


FIG. 31.—Abscess of the neck. Œdema of the right side of the head.

Inflammations of the other salivary glands should be treated in the same way. The abscess of the submaxillary should be opened from the outside through the skin, and sublingual from the inside of the mouth cavity. In the submaxillary, it is not necessary to put in a drainage-tube, but simply to keep the wound clean. Frequently we have developing in this region intense localized inflammations of the parotid and submaxillary glands which should not be confused with subcutaneous abscesses and effusion of blood which often appear in the vicinity of the larynx and front part of the neck as a result of traumatisms, such as fights, blows or contusions. The swelling may extend to the head and neck, and often reach an unusual size and then develop into a great œdema on the head which as a result will appear swollen in an unsightly manner (Fig. 31). The treatment in such cases consists in promptly making a free opening to allow the pus, which usually is noticeably hemorrhagic, to escape and heal, as an open wound, or hasten the healing by continuously dressing it with an antiseptic held in place by means of a Priessnitz compress.

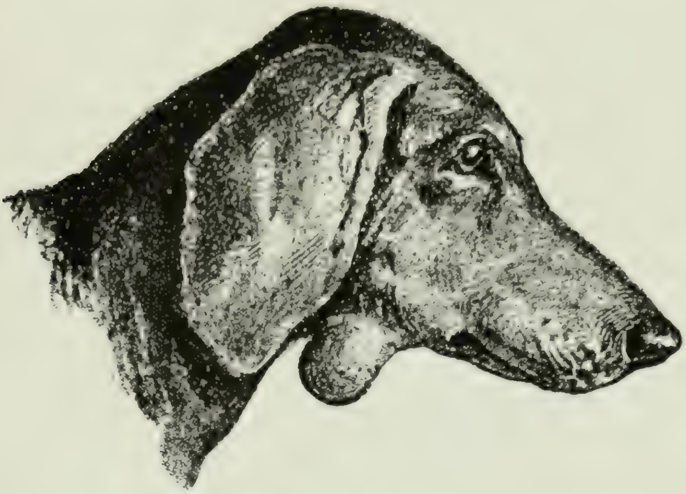


FIG. 32.—Mucous or honey cyst.

Occasionally we find cysts form in the glands of the aboral part of the sublingual tongue. These mucous cysts (colloid cysts, sublingual cysts) which may range in size from the size of a pigeon egg to the size of a fist, were first described by Siedamgrotsky as **honey cysts.** They are seen on the lower side of the mouth in the region of the larynx, and are covered by the muscles of the neck; or they may be on both sides of the larynx and appear as simple round or oval shaped, sometimes more or less sinuous, always cold, painless blisters, less often as a conglomeration of small, crowded vesicles with thin, coarse walls filled with a thin, sticky or thick, honey-like fluid (see Fig. 32). In some instances it is very thick, almost glue-like, and yellow or reddish. They originate without a doubt in the glands of the tongue, and then show a gradual cystoid degeneration at the marginal regions of the gland. As the cyst walls extend into the tissue of that organ they must be classed under the head of ranula. Instances occur with a mucous cyst on the outside, a ranula on the inside, that is, in the oral cavity, and both are connected with each other, actually forming one cyst.

In treating these cysts the only practical method to pursue is to remove them entirely, sometimes including the removal of the remaining part of the aboral sublingualis, for if they are simply cut into they return in a short time; but to cut out entirely a cyst located in this region is a rather dangerous operation, as the base of the tongue and the region of the larynx contain a large number of important blood vessels and nerves and even if the entire cyst is removed, we may injure the submaxillary gland, causing a salivary fistula that is impossible to heal. Consequently it is advisable to attempt to remove by operation only the smaller cysts; the larger ones can be treated in the following manner: Make an incision into the cyst, then inject into it repeatedly some mild corrosive such as diluted tincture of iodine, a weak solution of corrosive sublimate, or Lugol's solution of iodine (1 iodine, 3 potassium iodide, 20-30 water). These solutions act as irritants to the walls of the cysts, break them down, and destroy the secreting membrane and they soon heal up; the cicatricial contraction draws the tissues together and only a trace is left. Another method (according to Fröhner) is to use an aspirator or ordinary syringe, draw off the contents of the cyst, and inject into the cyst a 2 to 5 per cent dilution of Lugol's solution, injecting an amount equal to the original contents of the cyst. The object of this injection is to stimulate the formation of pus in the sac. If it does not produce the desired effect, after 3-4 days (exploratory puncture), draw off contents and inject again. After the pus has formed, make a long incision through the cysts and the cyst, changed into an abscess cavity, is treated as a simple surgical wound. Frick advises after opening the cyst and fastening the cyst wall to the skin, to cauterize the secreting cyst membrane with the thermo-cautery and sew up the opening. This causes that portion to slough off, and the wound to heal by granulation. The method suggested by Siedamgrotsky has been very satisfactory to the author. It consists of making a good, big opening in a dependent part and injecting the parts freely with mild caustic solutions, such as caustic potash or tincture of iodine. Dermoid cysts have been observed as a rare occurrence in the laryngeal passage (Vacheta).

Inflammation of the Mucous Membrane of the Throat

(Pharyngitis; Angina Catarrhalis; Sore Throat)

This disease in the dog is not by any means as important as it is in man, and as yet there have not been recognized any cases in the dog that could be compared with diphtheria, angina tonsillaris, and retropharyngeal abscess of man: at least such is the experience of the writers. The general affections observed have been common catarrhal inflammations which involve the whole or part of the throat.

Etiology.—The same causes that would produce stomatitis would bring on inflammation of the throat. The most common cause of angina catarrh is a continuation of the inflammatory processes from the neighboring organs; for instance, in catarrh of the nose, or in laryngitis, and it may appear as a complication of distemper and stomatitis. The chief cause is cold, particularly in hunting dogs, such as setters or pointers getting wet, when very warm, plunging into very cold water, with dogs who in the winter eat snow or frozen grass or drink ice cold water from ponds and brooks, or in house pets that run from very warm rooms in the winter and get out into the cold and there run about barking or lie on cold bricks or flag stones. This disease is very much more common in winter than summer and is more frequently seen in small or particularly fine bred delicate animals. Friedberger and Fröhner describe an epidemical infectious pharyngitis that affects young animals when they are from one to two weeks old, and which may lead to pyæmic metastases. Brandt reports one case of true pharyngeal diphtheria, and states that it sometimes goes through an entire kennel, attacking all ages.

Pathological Anatomy, Clinical Symptoms and Course.—The anatomical changes of the mucous membranes of the pharynx and soft palate which is always sympathetically affected, are the same as are recognized in all catarrhal inflammations. The mucous membrane is a diffused red, spotted or striated, swollen and only in case of severe diseases, coated with a dirty yellow purulent mucus, giving it a dull glairy appearance, on its upper surface, especially in its dorsal region, there may be seen a number of small, irregular granulations. As a rule, if the inflammation is at all severe, the tonsils are swollen and protrude out of their membranous pouches in the shape of bright brownish-red enlargements, furthermore the submaxillary and retropharyngeal lymphatic glands become swollen and occasionally the subparotid glands may be involved by the formation of an abscess. We very rarely see any fibrinous (croupal) membranes or true diphtheritic membranes and are only then to be expected in severe erosions of the mouth and pharynx (throat).

Clinical Symptoms.—The clinical symptoms of catarrh of the throat are similar to acute stomatitis, and it is only by making a careful examination of the throat that we can make a correct diagnosis. In more severe cases noticeable difficulties in swallowing appear, so that for instance when the patient drinks most of the water taken in, again flows out of the mouth and in very severe cases even out through the nose, while other noticeable symptoms are: An increase and alteration in the saliva, which is thick and tenacious, utterances of pain and attempts at evasion on manipulation in the region of the pharynx, and a swollen condition and increase in warmth of this region, the subparotid lymph glands also are swollen and painful. A slight fever is absent but seldom in severe cases of pharyngitis and often in addition to the described symptoms, coughing, a discharge from the nose and difficulty in breathing can be observed, a certain stiffness of the neck, movements of gagging and vomiting or real vomiting, etc. The mucous membrane of the pharynx should be examined and its changes from the normal considered. The author has found, as a rule, that catarrh of the stomach accompanies all these cases. Catarrh of the nasal passages and pharynx, and slight fever is also seen in these cases, and in rare instances vomiting. The course of the disease, as a rule, is favorable, but Fröhner says if the inflammation of the pharynx extends into the Eustachian tube it may cause deafness. Chronic pharyngeal catarrh is rarely or ever seen, but sometimes an ordinary case of catarrh of the pharynx may last three or four weeks and cases have been known to recur from time to time.

Therapeutics.—First examine the larynx and see if there are any foreign bodies present. This can be done by forcing open the mouth and depressing the tongue by means of a spoon handle or a spatula and then examining the fauces. Always be sure, however, to first determine that the animal is not suffering from dumb rabies. In these cases the owners are very apt to imagine the animal has pharyngitis or something stuck in the throat or eaten something that is poisonous. Most of the rabid dogs that were brought to the author for examination during the course of years were said to have ''something in the throat,'' and in more than one case the owners of the dogs were quite provoked that the dog's mouth was not immediately opened and examined with bare fingers. As a general rule radical therapeutics are comparatively seldom necessary when considering their favorable influence on the disease if the patient is kept in a warm place and is given milk, thin soup bouillon or other suitable soft or liquid foods. In more severe cases, the Priesznitz compresses can be applied to the throat, an external liniment, such as camphorated oil, soap liniment, laurel oil or camphor ointment, should be rubbed on the throat, or the mouth held open and by means of a brush or an atomizer sprayed or painted directly on the affected mucous membrane of the throat with astringent and antiseptic throat washes as lime water, hydrogen peroxide solution, solution of alum, tanic acid 1 to 2 per cent, potassium chlorate, borax 2 to 3 per cent solution, silver nitrate (.5 to 1%) and sodium bicarbonate or sal carolinum added to the drinking water is advisable. In more chronic cases, wash the mouth out with a solution of permanganate of potassium, boric or salicylic acid, or paint the throat with nitrate of silver (2 to 5% solution), or tannite of glycerine (5 to 10%), Lugol solution (1 to 3%), tincture of iodine, iodine-glycerine (.5 iodine, 2 potassium iodide, 20 glycerine). In severer case of nasal discharge the inhalation of steam, common salt (2%) creolin (1%), etc., is advisable. Abscess of the lymphatic glands must if necessary, after previous maturing, be opened with hot cataplasm (Fangs) or salves (wax salve) and then treated further according to general rules. Under ordinary conditions it is quite unnecessary to combat the fever.

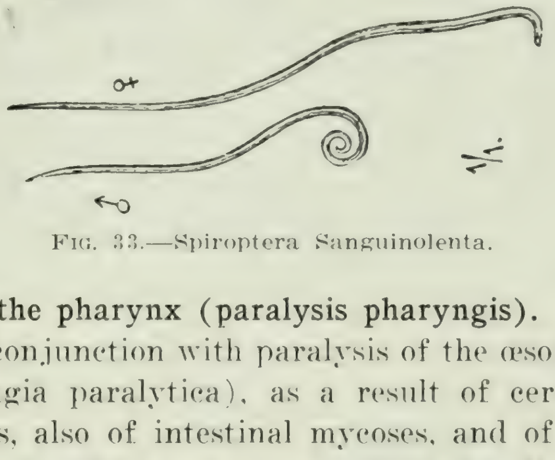


FIG. 33.—Spiroptera Sanguinolenta.

Paralysis of the pharynx (paralysis pharyngis). This appears for the most part in conjunction with paralysis of the œsophagus (paralysis œsophagi, dysphagia paralytica), as a result of cerebral diseases, of certain poisonings, also of intestinal mycoses, and of rabies as well as sometimes apparently of its own accord. With this disease the dog finds it impossible to swallow so that the food falls out of the mouth or, mixed with saliva is hurled from the mouth, sometimes also through the nose, if the animal coughs. Through incorrect swallowing cases of choking and aspiration pneumonia may occur. The treatment would consist of stimulating the skin, faradization and strychnine (subcutaneous).

DISEASES OF THE ŒSOPHAGUS

Foreign Bodies in the Œsophagus

The foreign bodies that become fixed in the pharynx or œsophagus of the dog in play or by gulping down their food as fast as possible, if another animal is near, are numerous and varied; they consist of portions of food, such as hard, irregular-sized pieces of meat or bread that have been taken in one gulp; long, sharp pieces of bone, such as mutton or fish, pieces of wood, needles, or nails, etc.; sometimes during play or retrieving, objects are swallowed by accident, such as stones, buttons, glass, or india-rubber balls, corks, etc., and lodge in the pharynx, at the entrance of the œsophagus; or if the object is small, it may go a certain distance into the tube and lodge there.

The symptoms may come on very suddenly and vary according to the general character and position of the foreign body. As a rule, the animal is restless and keeps the head and neck extended; sometimes the animal becomes delirious, reminding one of the conduct of an animal in the maniacal stage of rabies; it also throws its head about; it scratches itself on the throat or mouth with the paws over the spot where the obstruction is located. If it is in the pharynx, the animal shows signs of choking or may vomit, from time to time, small quantities of mucus and saliva, which is dirty and frothy and may be stained with blood, and later pieces of undigested food which in the later stages becomes fœtid. The substances ejected from the œsophagus do not give a positive test for free hydrochloric acid. It coughs frequently, and if the obstruction is large has difficulty in breathing and under certain conditions even has choking attacks, and it refuses to eat or drink. If water is forced on the animal, it passes down the throat very slowly and evi-

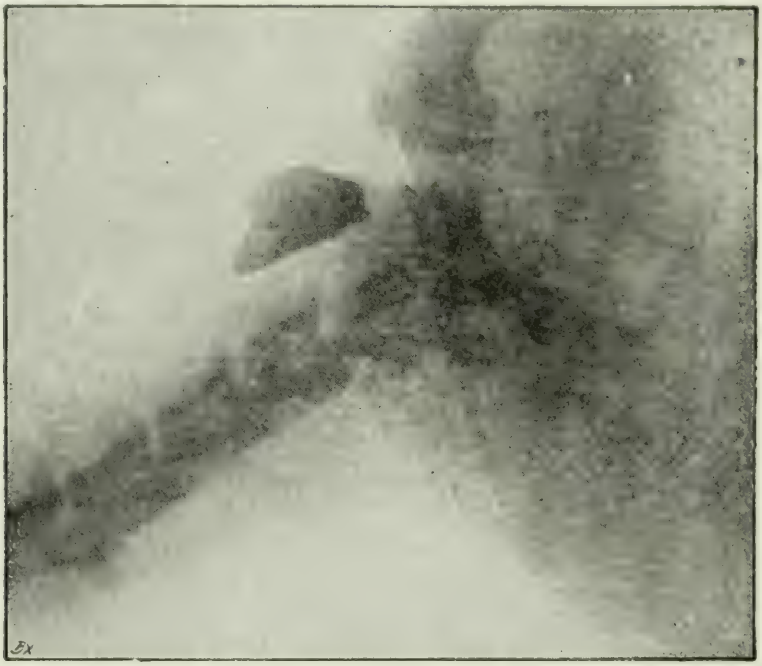


FIG. 34.—Foreign body (Rœntgen picture), crushed up piece of tin plate in œsophagus.

dently with difficulty, or may be vomited immediately after it is swallowed. If the foreign body is in the pharynx, it may be felt externally with the finger or, with certainty by opening the mouth and depressing the tongue, it may be seen or felt lodged in the pharynx; if it is in the cervical portion of the œsophagus, it can be detected by making a careful examination along the course of the tube or by the probang introduced into it, as has been described on page 29. The latter method is the only way to positively determine the presence of a foreign body when it has lodged in the thoracic portion of the œsophagus. In introducing the probang it must be carefully inserted, and if it should come in contact with the foreign body too great pressure must not be made on it, as it is apt to pack the object more firmly or even cause perforation of the tube. When making an examination of the tube externally, should we find a part that is painful, we must not consider it the obstruction unless we find a hard swelling with it, as foreign bodies such as sharp splinters of bone or wood often go down the tube, lacerate the mucous membrane in its passage, and do not become imbedded. Needles, pins and small pieces of wood may not be detected, even with the probang; in such doubtful cases the Röntgen or X-ray can be used to detect objects of certain density, such as metals, coins, etc., with the greatest certainty.

The object usually is either brought up by repeated vomiting or regurgitating motions or descends into the stomach. If it goes into the stomach, passes through the intestines and is passed through the rectum it causes no further trouble. Some authors have observed needles passed per rectum in the fæces. The danger lies in that the object may in its passage through the stomach and intestines cause disturbances which may become very serious. It may, however, lodge in the stomach and cause irritation and finally convulsions and death. If it is a sharp body, it may perforate the stomach, even find its way out again by perforating the abdominal wall. In rare cases the foreign body may, after perforating the œsophagus, form an abscess on the throat and escape to the outside or if it is in the thoracic portion of the tube, it may penetrate the wall, cause an abscess and escape, or it may penetrate the wall of the thoracic portion and set up septic mediastinitis and pleuritis and result fatally. It is also probable that death may occur from the foreign bodies, if they are sharp, by penetrating either the heart or one of the large blood vessels in the vicinity, and causing a hemorrhage, or it may also occur from septic inflammation of the œsophagus from choking, and from aspiration pneumonia.

Therapeutics.—The treatment differs according to the character and situation of the foreign bodies. If the foreign body is in the pharynx or at the entrance of the œsophagus, it must be removed immediately with the finger or a pair of curved forceps. This can always be done sucessfully if only after many vain attempts. If the obstruction is located in the lower portion of the tube, and it cannot be pushed down into the stomach with the probang, which must be undertaken only with the greatest care and without much force, it is advisable to attempt to get it up by an emetic—a subcutaneous injection of apomorphia muriate, as per page 36. If that is not successful, then perform œsophagotomy as soon as possible, before the intense swelling interferes with the operation. If this operation cannot be performed on account of the foreign body being situated too deeply in the thorax, it is best to give the animal very small quantities of lubricating substances, such as olive oil or any fatty oil. It is better to do this than to use any great force to push the object into the stomach. If the foreign body goes so far into the œsophagus that it lodges in the cardiac portion of the stomach and by manipulation it can be detected, gastrectomy can be performed and the foreign body removed in that way. Porcher and Morey performed this operation successfully. The so-called throat baskets or fish-bone catchers recommended to be used to extract fish bones or needles from the œsophagus usually prove to be useless.

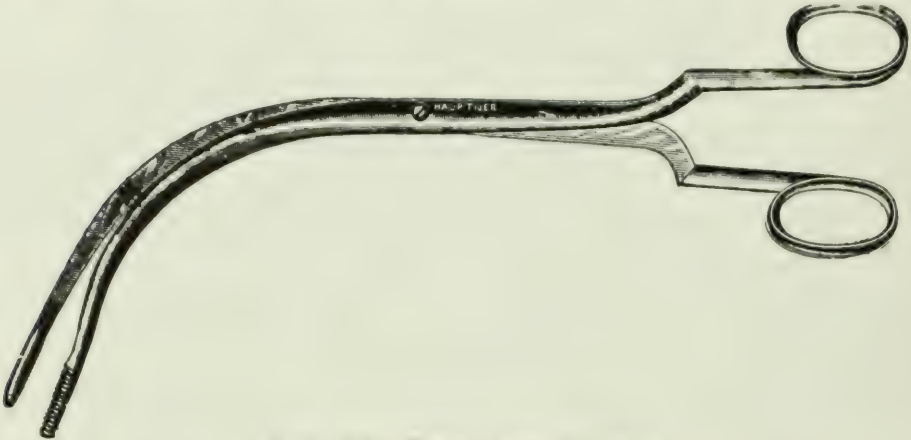


FIG. 35.—Œsophagus forceps.

In very rare instances we also find an inflammation of the œsophagus (œsophagitis). The causes to be considered are mechanical, chemical and thermal actions, inflammation in neighboring regions and parasites (spiroptera). This is best treated with lubricating oils, such as almond or sweet oil. We may see, occasionally, a constriction of the œsophagus (stenosis œsophagi) or a dilatation (ectasia and diverticulum), but these conditons are impossible to improve by any surgical means that we know of at present.

Œsophagotomy.—This is not a very difficult operation to perform in a dog. The animal is laid on his right side, and if not too weak, is narcotized or the locality sprayed with chloride of ethyl. The œsophagus is now exposed and examined to see if any portion is gangrenous from the injury. After having shaved off the hair, and washed the surrounding tissues with antiseptics, the foreign body is located, and an incision is made in the skin parallel with the jugular vein and over the foreign body, at the ventral or dorsal margin of the jugular. The incision is now carried through the subcutaneous tissues and muscles, and the œsophagus is exposed. Where the foreign body is located in the lower portion of the cervical region, the incisions can be made on the median line and by separating the muscles the œsophagus which lies on the left side of the trachea can easily be distinguished. The incision made in the œsophagus should be made longitudinally and only be large enough to allow the removal of the foreign body. After the extraction of the foreign body, the wall of the œsophagus should be sewed up with cat-gut, and the muscles sewed with silk and the skin either left open or a drainage-tube or gauze strip placed in the lower corner of the wound, after which it is closed by the suture. The opening is then treated as an ordinary wound. No food must be given for 48 hours, then only water or milk. The animal should be kept on liquid food for at least one week. When a large portion of the œsophageal wall is lost, that which is sloughed from necrosis, or seems practically dead, the edges of the wound in the œsophagus cannot be brought together, and the case is hopeless.

Injuries and Other Diseases of the Œsophagus

In rare instances we find inflammation of the œsophagus due to traumatic influences from without, usually they result from within, especially from a laceration of the wall of the œsophagus caused by sharp foreign bodies going down the tube or from foreign bodies becoming imbedded in the tube for a time and then dislodged, by injuries to the wall from the probang, and in still more rare instances from swallowing hot or scalding food, by spread of inflammatory process from the pharynx, or the presence of parasites (spiroptera). The symptoms are: Difficulty in swallowing, choking and vomiting motions, vomiting bloody saliva, phlegmatic swelling of the left side of the throat, sometimes emphysema of considerable extent, formation of abscesses with an eruption of pus outwardly. After small sharp objects have passed through the œsophageal wall they are often encapsulated in the neighboring soft regions without causing noticeable disturbances in the animal; in other cases they appear in an abscess in the jugular groove, after which they either heal completely or are followed by a fistula of the œsophagus. If the rupture (perforation) of the abscess occurs in the thoracic portion of the œsophagus the animal will die of septic mediastinitis and pleuritis. The treatment consists of a long incision through the skin, disinfection of the contaminated tissues and sewing up of the œsophageal wound. The skin wound remains open. Œsophagitis is recognized by great salivation, difficulty in swallowing, attempts at or true vomiting and great pain shown by the animal on manipulation of the œsophagus. The treatment consists in giving non-irritating food (milk), liquids, gruel or rice water and in severe cases, small pieces of ice at frequent intervals.

Strictures of the Œsophagus

(Stenosis Œsophagus)

This condition generally appears as obturation stenosis (obstruction of the œsophagus by foreign objects that have become lodged in the œsophagus, obstruction by formation of abscesses), and may result from the subsequent irritation and cicatricial contraction of the wall as a result of laceration by a foreign body. Occasionally we may find malformation of the wall caused by an inflammatory process of the same, from cyst formations, due to presence of spiroptera sanguinolenta, which grow between the muscles and muscular coat of the œsophagus (see Fig. 36), or less often by a compression stenosis from tumors, from malignant goiter (which press on the œsophagus from without), or as a congenital condition. Furthermore the strictures (adhesions) of scars should be considered. The symptoms of such injuries resemble those of obstruction of the œsophagus by foreign objects and have been already described on page 81. In cases where the stenosis gradually develops, the animal at first has a slight difficulty in swallowing. This becomes more and more difficult as the constriction of the œsophagus increases until finally food collects in a sausage-like mass, against the constriction. Examination by means of a probang makes a diagnosis more certain. The successful treatment of such a condition can only be expected if the cause is due to the obstruction of the œsophagus by foreign bodies or the removal of tumors if they should be the cause of compression in the region of the œsophagus.

Dilatation of the Œsophagus; Ectasia and Diverticulum

Smooth or sac-like dilatations of the œsophagus have been observed several times in dogs. This has been described by a number of authors and is indicated by great difficulty in swallowing, by salivation, by vomiting, etc. If the dilatation is in the cervical region, along the line of the œsophagus, we find round or elongated spindle-shaped lumps, varying in size, and by manipulation this collection of food can be worked down into the stomach. The probang may be used to start it. Great care, however, should be taken not to use too great force, as it will only pack the food and fix it. The changes occurring in the ability to manipulate the probang are said to be characteristic; the probang moves along according to the degree of fullness of the diverticulum, sometimes it slides smoothly into the stomach, at other times it will strike upon an absolute obstruction. In case of ectasia of the thoracic portion of the œsophagus the Röntgen rays can be used after first administering dermatol emulsion. The prognosis, as a rule, is unfavorable, but if the animal is kept on liquid food exclusively, it will live for a long time.

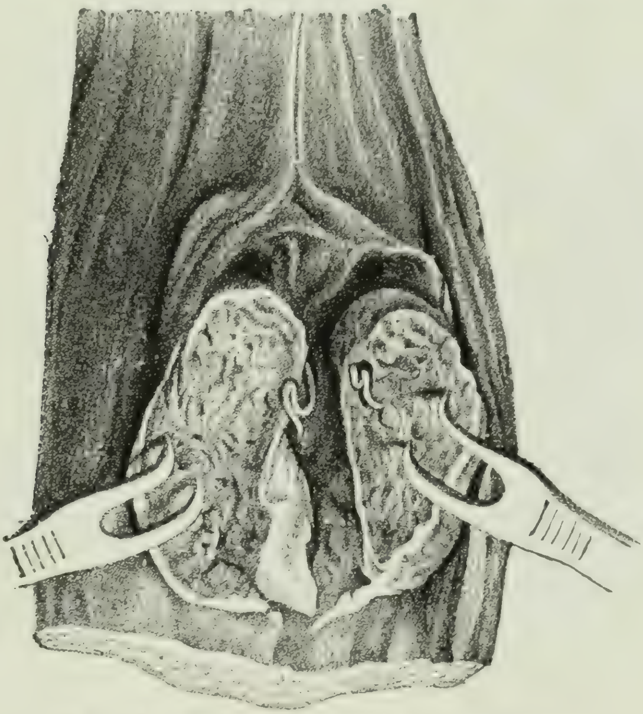


FIG. 36.—Spiroptera cysts in œsophagus.

Paralysis of the Œsophagus

(Dysphagia Paralytica)

This is due to the paralysis of the nerves that supply the region of the neck, seen particularly in conjunction with paralysis of the larynx. It may occur as a result of certain brain diseases, from certain poisons, from intestinal mycosis, and also as a symptom of rabies. It is recognized by constant dribbling of saliva from the mouth. The animal may make efforts to drink water, but while the movements of the muscles of the neck would lead you to think the animal was doing so, on close observation of the vessel from which the animal was drinking, it shows little or no diminution in the contents.

DISEASES OF THE STOMACH

Acute Catarrh of the Stomach

(Gastritis Catarrhalis; Gastricismus; Acute Dyspepsia)

Etiology.—The following are generally the causes of this very common disease: Hot, frozen, fermenting or decaying alimentary matters, filthy, putrid water from puddles and ponds, overfeeding or gorging after a long fast, foreign bodies, such as sand, stones, buttons, splinters of wood, and undigestible food that is not adapted or intended to be eaten by dogs, and also from the presence of parasites. Sometimes catarrh of the stomach spreads to such an extent as to become almost an epizoötic. As regards toxic gastritis, which are caused by very sharp or corroding poisons, that will be taken up later on. We find also that some diseases, such as distemper, some affections of the liver, and intestinal catarrh have acute gastritis accompanying them. Very often acute catarrh of the stomach is developed from simple colds, or clipping the animal, too frequent bathing, and not drying it properly.

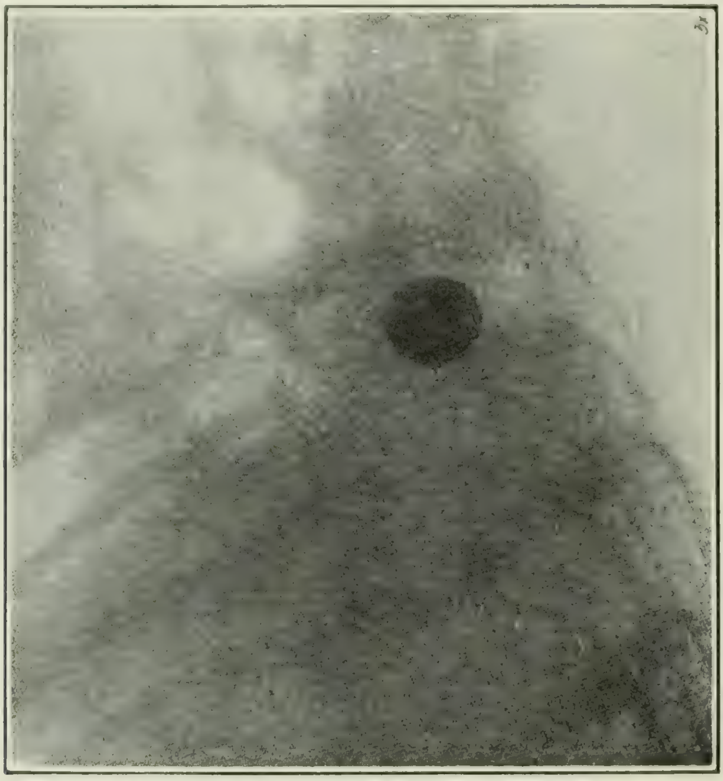


FIG. 37.—X-ray picture of coin in the stomach.

Pathological Anatomy.—The mucous membranes of the stomach are hyperæmic and swollen; the folds of the membranes are loosened and covered with a thick tenacious mucus. At times there are seen small hemorrhages and erosions on the membrane.

Clinical Symptoms.—The first symptom of acute catarrh is loss of appetite. The animal will be very dainty and pick out certain pieces, generally meat, and eat them slowly, or, as is generally seen, refuse food altogether. The animal is usually very thirsty, drinking large quantities of water. If the disease is just fairly severe the animal vomits frequently, especially after eating or drinking, but may vomit without anything on the stomach. If after eating, it consists of masses of undigested food encased in a tenacious mucus and saliva; if after drinking water, the water is tenacious and forms frothy bubbles of thick mucus—this may be streaked with blood or more or less tainted with bile, according to the condition of the liver. The tongue is almost always coated with a thick, white mucus and dry, and on pressure in the region of the stomach the animal evinces pain, and the stomach may be distended with gas (see page 20). In severe cases the animal is irritable and wants to keep in the dark or in cool places and not be disturbed, or may whine occasionally or give sharp short cries, change from place to place, and give every indication of stomachache. The nose is dry and the body temperature uneven, that is, body hot, extremities cold, and there may be some rise of temperature (febris gastrica), but only rarely do these symptoms develop into anything serious. If, however, the symptoms are of an alarming character, they are generally caused by some toxic condition, due to the formation of poisons, generated in the stomach (ptomains). With this we have a putrid smell from the mouth, great depression, or even complete coma, and evidences of acute narcotic poisoning. See chapter on Mycotic Stomatitis, Catarrh of the Intestines and Inflammatory Hemorrhagic Gastro-Enteritis.

There are always some intestinal complications. There is often constipation, sometimes excretion of fæces, generally diarrhœa; and very often there is a biliary discoloration of the urine but only occasionally icterus of a catarrhal nature. The animal if strong and not too young, as a rule, makes a good recovery, while very young dogs, especially with improper treatment, may finally die. If the causes continue to act then the acute gastritis will become chronic.

Therapeutics.—The treatment differs according to the exciting cause, and also the severity of the symptoms.

1. If the cause has been the eating of some putrid matters and you suspect some to be present in the stomach, or if simply overloading

the stomach, it is best to give the animal an emetic, such as the hypodermatic injection of apomorphia, as described on page 36; such emetics as tartar emetic, ipecacuanha or antimonial wine are not advised; they are all very depressing. While the apomorphin is acting after the animal vomits it is well to give the animal 8 to 10 ounces of warm water with a small quantity of bicarbonate of soda or salt in it, and if the vomited matter is putrid and offensive to smell it is good practice to add a little creolin to the warm water. Because of the possibility of starting hiccoughs it is advisable to proceed with great care. If it is not advisable to administer emetics in such cases where the animal is greatly depressed or for any other reason, calomel or Glauber salts can be given to sweep the intestinal tract.

2. If a decided lack of appetite and frequent vomiting from an empty stomach occurs then it is advisable to resort to a demulcent treatment and one that will quiet the nerves—as administering bismutum subnitricum, opium or morphine, or an oil emulsion treatment which the author has found from personal experience to be the most satisfactory. In place of the peanut oil designated in the recipe any other neutral fatty oil may be used. In addition to this, ice pills, sodium bicarbonate, potassium bromide (internally or rectally), creosote, tincture of iodine (by drops; very diluted), chloral hydrate, cocaine, chloroform (several drops on powdered sugar or in mucilage), are recommended in case of severe vomiting. Furthermore hot mash compresses (flax seed mash, fango) on the region of the stomach (less satisfactorily Priessnitz compresses), often produce good sedative results.

℞	Morphin hydrochloric		0.02
	Bismut. subnitric.		
	Sacchar.	āā	0.5

M. f. Pulvis. D. tal. dos. No. iv.
S.—Every 2-3 hrs. one powder until vomiting stops.

℞	Olei arachidis	20.0
	Gummi arab.	10.0
	Az. Cinnamoni	100.0

M. f. Emulsio.
D. S.—Every 2-3 hrs. one coffee or tablespoonful.

3. If the attack is less severe or if conditions have improved, after either one of the above treatments has been applied, to such a degree that the only remaining trouble is lack of appetite, then certain bitters (stomachics) can be given—as tinctura chinal composita, tinctura rhei vinosa (teaspoonful or less at a time), condurango wine, china wine, pepsin wine (by the coffee or tablespoonful), or alkalies can be given—as sodium bicarbonate and "Karlsbad" salts (pinch at a time). Some-

times a very weak solution of hydrochloric acid or "Urexintannat" (0.2-0.5 several times daily) is beneficial. Any intestinal complications that may arise must be treated according to principles given later. As a general rule diarrhœa should not be checked immediately.

℞ Tinct. Rhei vinos
Elix. Aurant. com. āā 25.0
M. D. S.—Give a teaspoonful 2-3 times daily.

℞ Acid. hydrochlor. 3.0
Aq. destillat. 150.0
Sirup. Aurant. Cort. 15.0
M. D. S.—Several coffee to tablespoonfuls to be given daily.

℞ Sodii bicarbonatis 15.0
Elaeosacch. Menthæ pip. 5.0
M. f. pulvis.
D. S.—Given in quantities of knife tipful.

℞ Orexin. tannic. 0.5
D. tal. dos. No. x.
S.—Give 2-3 powders daily.

Keep the animal on a low diet in the beginning; let the animal do without food and drink for a day, and then give small quantities of milk or finely-cut-up meat, soup, or beef tea, with or without egg, sage soup, barley soup, a pigmented stomachic, such as tincture of rhubarb or nux vomica in small doses; if there is vomiting, carbonate of sodium or magnesium is to be given in small doses, several times daily. Essence of pepsin is also useful to settle the stomach; it must be given in teaspoonful doses three times daily.

Chronic Catarrh of the Stomach

(Gastritis Catarrhalis Chronica; Chronic Dyspepsia)

Etiology.—Chronic dyspepsia is rather common in the dog, especially if the animal has had several attacks of acute dyspepsia. It may also appear as a secondary complication of various diseases, such as chronic disease of the liver, lung or heart, cancer of the stomach, gastric tumors, and parasites.

Pathological Anatomy.—The mucous membrane is covered with a tough, glassy mucus, dirty-white in color. In the early stages the mucous membrane is red, and as the disease continues the membrane becomes pigmented or dark gray in color, due to pigment stains and more or less swollen, less often atrophic.

Clinical Symptoms.—They are similar to those of the acute catarrh of the stomach; but the appetite, while it may be very irregular, is not entirely absent—one day very good and the next absent. Vomiting, if noticed at all, occurs generally a short time after eating, and consists of undigested food and quantities of tough, glassy mucus, sometimes streaked with blood, and the tongue is more or less coated. There is sometimes pain on pressure in the region of the stomach, especially after eating, although this is not a constant symptom by any means. The animal becomes thin and shows every symptom of poor nutrition in all prolonged cases.

We must always take into consideration that the mere loss of appetite does not always mean acute or chronic catarrh of the stomach, but is a symptom present in a number of pathological conditions, and every symptom must be carefully examined before coming to a definite conclusion.

Therapeutics.—The washing out of the stomach, so often resorted to in man, is fully explained on page 35. This treatment is not to be employed in all cases of this disorder; for in some cases it produces great irritation, and if persisted in does more harm than good. If advisable then the irrigation and washing out should be done when the stomach is empty once a day and with warm water at about 30° C., to which has been added some sodium bicarbonate, or in case of more evident signs of fermentation boric or salicylic acid. Try to get the animal to drink small portions of water, with some lime water in it, at frequent intervals; if it will not drink, pour fresh water down its throat; in anæmic animals, use tepid water, with a small quantity of a solution of bicarbonate of sodium, a pinch or a teaspoonful of Carlsbad salt, in warm water, on an empty stomach. Hydrochloric acid well diluted can be given after meals and the treatment described on page 87. In addition the bitters mentioned recently can be administered in small doses. In very acute cases give naphthaline, salicylic acid, resorcin, menthol, or thymol. As a rule, however, it is advisable not to do this unless you suspect some irritant or poisonous material to be present. If the chronic catarrh occurs as a result of other diseases, not only the diet must be regulated but we must treat the original cause, as very frequently when the other disease is treated successfully, the gastric mucous membrane returns to its natural condition without any other treatment, as well as the independent chronic dyspepsias, the indicatio causalis, that have their origin independently of other diseases, also need special treatment.

℞	Extracti rhei	2.0
	Sodii bicarbonatis	10.0

M.

Sig.—A small pinch twice daily.

℞	Mentholis		2.0
	Saccharis lactis		
	Gummi arabici	āā	1.0

M. et fiant pulv., No. x.
Sig.—Give one twice daily.

Other Disorders of the Stomach

Expansion or Dilatation of the Stomach (Gastrectasis, Dilatatio Ventriculi).—This condition may occur in the acute or chronic form. In acute it is due to overloading the stomach with dry food and particularly when the food is of poor indigestible character, capable of swelling or fermenting, causing the formation of gas. If the stomach is not emptied by an emetic, the abdomen becomes greatly distended, particularly in the epigastric region. The animal is restless, moving from one place to another, the expression is haggard and indicates pain, there is quick catchy respiration, and the pulse greatly increased in number. In severe cases the animals die with dyspnœa. In less acute cases the animals slowly recover or it is followed by an attack of acute gastric catarrh.

The treatment consists in administration of an emetic, such as a hypodermic of apomorphia.

A chronic dilatation of the stomach is frequently seen in dogs that are fed on poor food and in animals that gulp down their food, particularly when they are only fed once daily. It may also occur from contraction of the pyloric end of the stomach or duodenum, from cicatricial contraction, the presence of carcinoma, or from weakness of the walls of the stomach; this latter condition is rarely seen. In chronic dilatation of the stomach there are all the indications of chronic catarrh with noticeable distention of the abdomen, particularly in the epigastric region. On percussion of the region of the stomach a dull tympanic sound, which usually disappears after the animal has eaten any food, is heard, then palpation of the stomach produces a splashing sound.

The treatment consists in giving the animal a change of food (mentioned on preceding page) and smaller quantities at shorter intervals and the same medical treatment as is advised under chronic dyspepsia. If it is suspected or diagnosed that there is pyloric stenosis, you should try to remove it by surgical means with the same method used for humans.

Reversion or Inverted Stomach (Torsio Ventriculi, Volvulus Ventriculi).—This is observed where the stomach is turned on its axis and, as a rule, occurs in the larger breeds of dogs. The stomach is completely reversed, so that the pyloric end is found in the left epigastric region instead of the right, and the large curvature, instead of being on the left, is found on the right and the œsophagus has a spiral twist in it just before entering the stomach. On making an abdominal incision the stomach is found to be greatly distended and the spleen is displaced and greatly enlarged through passive hyperæmia. The causes that may produce this condition are violent exercise, particularly running up and down steps with an empty stomach (Cadiac), or the same exercise with a greatly distended stomach (Jensen), or stomach not filled uniformly (e. g., with water and large pieces of meat or bone). The symptoms come on very quickly, great distention of the abdomen, in which the stomach can sometimes be felt like a tautly distended bag, refusal to eat or drink, dyspnœa, cyanosis, pain on pressue of the region of the stomach, colicky pains and futile efforts at vomiting. Death generally occurs in from 30 to 40 hours, either by suffocation or paralysis of the heart. The treatment recommended by Cadiac is to gradually remove the gas from the stomach by means of a trocar and opening the abdomen and returning the stomach to its original position.

The latter is done by pulling the large curvature to the left with one hand, and the pylorus with the duodenum to the right with the other hand. The operation should be performed under complete anesthesia; possibility of success can only exist with this operation if it is performed within 10 hours after the first symptoms are evident.

Another, but much less frequent, displacement of the stomach is when it falls forward and becomes wedged into the œsophageal opening of the diaphragm.

Foreign Bodies in the Stomach.—By this we mean pieces of bone, cork stoppers, sponges, stones, glass, balls, pieces of money, rubber balls, needles, hair balls. These produce the following symptoms: Continued vomiting, loss of appetite, restlessness, animal screaming with pain or howling, animal attempts to bite all who touch him, colic and in the later stages great depression; but only when foreign bodies get into and become lodged in the pyloric intestinal-like portion of the stomach; otherwise there may be no noticeable symptoms at all or there may be no other symptom than acute or chronic catarrh of the stomach. We may detect the foreign bodies by palpation or if it is of metallic nature by means of the Röentgen or X-rays (Fig. 37).

Therapeutics.—If the foreign body is diagnosed, give an emetic. Moller advises giving a good meal before the emetic is administered so as to assist in holding the foreign body when the emesis occurs and this prevents it doing any harm to the tissues. If the emetic does not succeed in removing the foreign body, and the position of the foreign body is such as to prevent a laxative from giving successful results, then laparogastrotomy must be performed. This is described in detail under Laparo-enterotomy, which operation it closely resembles. In performing that operation for this particular case, the incision should be made on the linea alba close up to the xyphoid cartilage and thus bring the incision close and parallel to the great curvature of the stomach; or, as Frick advises, on the diaphragmatic position of the stomach directly on the great curvature. In this operation, great care must be taken not to cut any of the large arteries of the stomach, which are located on the great curvature. The latter method is to be preferred beyond doubt inasmuch as the gastric folds run parallel with the great curvature of the stomach. The animal must be fed on the lightest of liquid food for at least a week after the operation.

Ulceration of the Stomach (Ulcus Ventriculi).—When bleeding occurs from the stomach as the result of some acute inflammatory condition of that organ, it always leaves an erosion of the mucous membrane. As a rule, this heals up very rapidly in the dog, rarely leaving any cicatrix on the membrane; abrasions of the mucous membrane from sharp pieces of bone, splinters, or caustic agents also heal up very rapidly.

Occasionally, however, we see true ulceration of the stomach. The real cause of this condition has not yet been satisfactorily explained, although many investigations have been made on the subject.

The ulcer in the beginning is an inflamed circular spot, from which the mucous membrane peels, and gradually disappears, extending to the deeper tissues where it forms a yellowish-red, unhealthy surface, with an irregular, hard, indurated border. Very often they heal up, leaving an irregular cicatrix, usually circular in shape.

In the dog, as in man, we find that in rare instances the ulceration is so extensive as to perforate the stomach to the serous membrane and form adhesions to the adjacent organs.

This condition may be present without presenting any symptoms that can be recognized, and it is only on post-mortem that it is recognized, either by the presence of the ulcer, or a cicatrix is seen on the mucous membrane of the stomach. The symptoms recognized are generally those of gastric catarrh, with vomiting of blood at irregular intervals. The treatment consists in administering, and in case of decided restlessness it is advisable to use oil emulsion and hot cataplasms (flax seed poultice, fango), bicarbonate of sodium, argenti nitras or, better, some of the organic compounds of silver, or subnitrate of bismuth is useful, but the use of hydrochloric acid or a stomach-pump is contra-indicated.

Cancer of the Stomach (Carcinoma Ventriculi).—Cancer of the stomach is very rare. Symptoms consist of irregular attacks of gastric catarrh with possibly vomiting of blood, and gradual loss of flesh, and if the carcinoma is located in the pyloric end of the stomach, we would be apt to find pyloric stenosis and dilatation of the stomach. Eberlin describes a case in which a carcinoma was present in the pylorus and duodenum and accompanied with acute icterus. It is almost impossible to detect with any degree of certainty such a cancer by palpation and by Röntgen rays with dermatol emulsion, but more possible by the evidence of cancerous tissue in the vomited blood and by exploratory laparotomy. The operative treatment (resection) has no practical significance since the strict diet which must necessarily follow over a long period of time cannot be enforced.

Other kinds of tumors have been located in the stomach of the dog, e. g., lipoma, adenoma and sarcoma. Parascandolo performed gastrectomy and removed a cancer from the stomach with complete success.

Parasites of the Stomach.—The spiroptera sanguinolenta is frequently the cause of stenosis of the œsophagus (see Fig. 36). In the adult form this parasite is from 3 to 7 cm., the male 3 to 4 and the female 6 to 7 cm., and are blood red in color. Several occur in one ulcer the size of a pigeon's egg. The parasite is found in the submucous tissue, usually with a small opening into the stomach. In rare instances, this parasite whose larva lives in the abdominal cavity of kitchen cockroach (Blatta orientalis), is found in the bronchial glands, the aortic wall, in the lungs, and in the neighborhod of the kidneys (Railliet). The general symptoms of these parasites in the stomach are those of catarrh of the stomach, combined with extraordinary gradual emaciation and sometimes great restlessness, which may even cause one to suspect rabies. Hunter describes a dog who was greatly emaciated and was destroyed as suspected of having rabies. On post-mortem, the mucous membrane of the stomach was very much congested, and he found six nodules the size of a walnut, in which there were numerous spiroptera sanguinolenta.

Very rare instances have been known to occur where the larvæ of the Gastrophilus equi were found on the mucous membrane of the stomach of the dog. The egg may have been deposited in the hair of the dog, and by being licked off by the animal, reached the stomach or, from depraved appetite, the animal ate horse droppings. This mode of transfer was done experimentally by Railliet.

DISEASES OF THE INTESTINES

Intestinal Catarrh

(Catarrh of the Bowels; Enteritis Catarrhalis; Diarrhœa)

Etiology.—Catarrh of the intestines originates frequently from the same causes as catarrh of the stomach, when the animal has eaten some irritating substance, and it frequently happens that the two diseases occur together.

Intestinal catarrh is generally caused by the animal eating decayed, tainted, fermenting, or indigestible food, or from intestinal parasites or poisons. It also appears in an infectious form, attacking entire kennels and animals of all ages. It is frequently caused by cold or certain infectious diseases and sympathetically in other disturbances of the intestinal tract, such as distemper, septicæmia from disturbances of the circulation and from disorders of the liver, lungs, heart. Coccidia are supposed to cause this disease, but the writer never found but one case in all his observations; in this one case the animal was greatly emaciated.

According to the duration and severity of the disease, we determine whether we have acute or chronic catarrh of the intestines. The acute form of the disease lasts from one to two weeks; the chronic often for months.

The causes of acute and chronic catarrh in the intestines are similar; the latter is frequently developed from the acute form and from frequent return of the disease, the system becomes weakened and the disease remains in a milder, but chronic form.

The disease may be located either in the small or large intestines, or in both. The small intestine is the common seat of the disease, but in animals with short intestines it is frequently found also in the large intestines. The various classifications, such as duodenitis, jejunitis, ileitis, typhitis, colitis and proctitis, are useful only to the anatomist, but not to the observer. Proctitis, however, is an exception since it is frequently seen in the dog in an isolated form. This is given with more detail on pages 98 and 121.

Pathological Anatomy.—The effects of catarrh of the intestines are practically the same as in all irritations of the mucous membranes. In the acute form, the membranes may be swollen and reddened through the entire intestine, or it may be confined to certain localities, where it is reddened and congested, and the membrane raised and covered over its surface with flaky, slimy epithelium. In very bad cases there is a large number of these purulent epithelial masses, with desquamation of the mucous membrane. These masses of inflamed follicles become grayish white in color and project from the membrane or finally become ulcerated. In some diseases, where there is severe catarrhal inflammation of the mucous membranes, we find a sympathetic inflammation of the intestine, in some cases even a necrosis from which follows ulceration of the bowel. The writer had one case under his observation, where a young dog died from a necrotic ulceration of the bowels.

In the chronic form, the mucous membrane may likewise be reddish but often it is livid, grayish-red or slate colored, even almost black and sometimes exceptionally pale in color. In rare cases it is slate color. The swelling, forming a true hyperplasia of the membrane, is greater and covers a larger area than in acute catarrh and the inner surface of the bowel becomes irregular and uneven with projections over the entire surface. In some cases the membrane shows true polypous formations, due to circumscribed hyperplasia of the connective tissues. Where there has been cystoid degeneration of the follicles, the intestinal secretions are stopped entirely and the mucous membrane is thin and smooth. Further information can be found in text books on pathological anatomy.

Clinical Symptoms.—The most prominent symptom of intestinal catarrh is diarhœa, especially if it is confined to the large intestine, although there may be no diarrhœa whatever if the inflammation is confined to the small intestine, as it is well known that the absorption of the fluids and the formation of the fæces are confined to the large intestine, and we often find intense inflammation of the small intestine, which is always accompanied with profuse diarrhœa without having the large intestine affected whatever. On the other hand, we often find inflammation of the rectum and no diarrhœa at all, but other noticeable symptoms (see later).

In making a diagnosis it is well not to identify too closely diarrhœa and catarrh of the intestines—that is, to consider each case of diarrhœa as being due to catarrh of the bowels—as there are many conditions that increase the peristaltic action and cause diarrhœa that are not directly due to inflammation, such as cold from a sudden chill, to an animal that has been kept warm, to poisonous substances, from the administration of laxatives or cathartics, or great exertion in an animal, not accustomed to it. It is, however, impossible to draw a distinct line between intestinal catarrh and diarrhœa, but a conclusion can be arrived at by the number, amount, and character of the diarrhœic discharges.

The number of stools varies, to a certain extent, and their consistency, from pulpy to thin, water evacuations. At first the passages are clearer than natural, and yellow, and as the condition goes on they become gray; this color is due to the fact that the passages are so frequent that the liver is not able to furnish sufficient bile to color them, and in a number of cases, there is a certain amount of thick gelatinous mucus mixed in the excremental matter. In some cases the mucus becomes very copious, and sometimes the passages are nothing but mucus, frequently frothy, the stool being filled with small bubbles of gas and an intensely offensive odor, and in rare cases blood and pus are present; for further details see page 45.

In intestinal catarrh the animal is restless, changing its position frequently, groans or cries, arches the back, or may rest the forepart of the body on the ground and have the hind quarters elevated. This is an indication of colicky pains. The examination of the abdomen externally does not furnish much information. Sometimes the abdomen is drawn up; in other cases it is distended. On applying the ear to the region of the abdomen, a great amount of gurgling or rolling is heard in the cavity; this may often be heard quite distinctly some distance from the animal. This is due to the increased peristaltic action. On pressing the posterior part of the abdomen, the animal often evinces pain.

Tenesmus of the rectum is generally present if the posterior portions of the intestines are greatly involved. The animal makes prolonged and repeated efforts to pass the excremental matter, and finally passes only insignificant amounts of fæces or small amounts of mucus and blood, after great exertion. In some cases these prolonged exertions cause the lower bowel to be protruded. It may lead to a temporary protrusion of single folds of the very red and swollen rectal mucous membrane or it may even terminate in a true prolapsus recti. This, however, is generally seen in young puppies and only in very rare instances in older dogs. If the tenesmus is very great, it indicates that there is great irritation of the lower bowel (as regards the examination of the lower bowel, see page 48).

The other symptoms of catarrh of the intestines are as follows: The color of the urine becomes dark from the tinting of the bile pigment and is lessened in quantity from the drain of fluids from the bowels. Fever is quite frequently present, but it is generally slight. There is loss of appetite, vomiting, and yellow or icteric coloring of the mucous membranes, great thirst, and the animal becomes weak very quickly and shows great depression. This is specially noticeable when the inflammation is due to eating decayed meat.

Chronic catarrh of the bowels resembles the acute form in many ways, but it is less severe in its symptoms. The most important are as follows: The fæces change from soft to firm, like the stools of diarrhœa, and vice versa; the animal becomes weak and thin, showing signs of anæmia, but in the chronic cases the appetite is generally very good. In some cases where the disease has been present a long time, when we examine the intestines by palpation, through the abdominal wall, the intestines are found to be firmer and less elastic and scarcely or not at all sensitive to pressure. This is a very characteristic symptom of chronic intestinal catarrh of long standing.

Prognosis.—In strong animals, acute intestinal catarrhs are generally not very serious, but in young dogs or puppies, it causes great exhaustion and they die from collapse before the diarrhœa can be checked; the chronic form even in old animals is generally very hard to control and must be looked upon as a grave condition. Often attacks follow one after the other, completely prostrating the animal and carrying it off finally. With secondary catarrhs the prognosis must be governed by the nature of the principal or primary disease.

Therapeutics.—In slight cases the only thing to do is to keep the animal in an even warm temperature, frequently rub the abdomen, refraining as much as possible from giving even the lukewarm drinks (water, camomile tea, acorn coffee, cocoa), regulate the food and, as a rule, lessen it in quantity and make it easier digested. Soup (oatmeal, barley grits or rice), or broth, mixed with bread or biscuit, rice, etc., friction to the stomach and a small quantity of alcohol, in the form of whiskey or sherry, for weak, delicate dogs. It must be borne in mind that in all cases of this disease the treatment will depend entirely on the causes and symptoms that are observed. If the cause has been the ingestion of decayed or putrid substances, stagnant fæces, or internal parasites, the first thing to do is to clean the intestinal canal out by means of a purgative, such as castor oil (pure, in emulsion form or as ricinus-siccol), calomel, Glauber salt, or in weak subjects or puppies, olive oil.

If there is any indication that the liver is disturbed, it is best to first administer a dose of calomel and follow up with a saline purgative. If the catarrh has been of long duration and where there are copious and thin discharges and an indication of excessive peristaltic action, laxatives are contraindicated, and if definite symptoms of colic appear then it is advisable to use narcotics, and in this instance opium is always indicated, powdered opium, laudanum, morphia or Dover's powders. The attempt to substitute extract of belladonna or hyoscyamus and bromide of sodium in this disease has not proved to be very successful. Otherwise we should use the true astringents, such as tannic acid, calumbo root, and cascarilla bark, or the modern, highly recommended substitutes, e. g., tannalbin, tannopin, tannoform, tannothymol, which are best given in red wine in single doses of 0.5-2.0, or daily doses of 2.0-5.0. Certain preparations of bismuth have a tendency to disinfect the intestinal canal and also to soothe the irritated mucous membranes. Xeroform (bismuth tribromphenyticum) or bismuth subgallate or subnitrate, given in doses of 0.5-2.0 often develops most satisfactory results. If ulceration of the bowels is indicated by symptoms, the albuminoid or organic preparations of silver or nitrate of silver, argentum nitricum, are to be given in pill form, followed up by small doses of naphthalin, salicylic acid or creosote. A valuable supportive treatment to the internal therapy consists of the Priessnitz compresses, and especially—in cases of pronounced colic—hot compresses of flaxseed mash or fango. If we suspect that there is a certain amount of putrid matter in the intestines beside, use saline laxatives to sweep out the decayed material; after doing this administer in addition to one of the previously mentioned medicines (tanneform, tannopin, tannothymal, xeroform or resorcin) (see treatment of mycotic gastro-enteritis), also creolin, creosote, menthol thymol, naphthalin or calomel (in broken doses). Furthermore "White bolus" often produces unusually good results if given for such cases of diarrhœa, as well as all of bacterial nature, in doses of several coffee or tablespoonfuls in water, amount depending upon the size and age of the patient. In like manner, but in smaller quantities, charcoal (carbo animalis, carbo vegetabilis) could be tried.

If it is mainly a matter of diseased condition of the large intestine then in addition to the medical treatment just mentioned it is well to make one or two irrigations of the bowels daily by means of a rubber funnel and a piece of rubber hose with a pipe of hard rubber at the end, which is inserted in the rectum, as far as possible, and the fluid poured into the funnel and allowed to gravitate slowly into the bowel. The best solutions to use are flaxseed gruel, mucilage, thin starch paste, a 1 to 2 per cent solution of tannin, alum, or 0.2 to 1 per cent solution of silver nitrate or one of the various synthetical silver salts (argenol, argyrol, argentamine, picratol), the solution to be about 30 per cent. The amount to use is about 1 to 2 liters. If this amount causes much irritation and straining, it must be discontinued; but it is well to give the animal at least one injection by this method, as it helps to clean out the lower bowel and facilitate the action of the medicinal agent.

Any evidence of the appearance of weakness is to be treated in the manner designated under "Gastro-Intestinal Inflammation."

℞	Decoct. Rad. Colombo	15.0:150.0
	Tinctur. opii simpl.	5.0

M. D. S.—One tablespoonful every 2 hrs.

℞	Xeroform	10.0
	Radicis Liquirit.	
	Succ. Liquirit. q. s.	

Misce et fiant pilulæ No. x.
D. S.—Give 2-3 pills daily.

℞	Tannalbin (Tannoform)	8.0
	Elaeosacchar. Menthae pip.	4.0

Misce et fiat pulvis.
D. S.—One level to heaping coffeespoonful in red wine every 3-4 hrs.

℞	Creosoti	0.5
	Aq. dest.	120.0
	Mucilag. Gummi arab.	30.0

M. D. S.—Give one small to one tablespoonful every 3-4 hrs.

The inflammation of the rectum (proctitis) likewise requires local treatment. If this disease does not appear in conjunction with or as a result of intestinal catarrh, but more or less as an independent disease, then it is caused chiefly by mechanical irritants (hard, dry balls of fæces, bone fæces, parasites, irritating enemas, and foreign bodies (bone splinters, pieces of wood, sand, earth, etc.) that have remained lying or become lodged in the rectum). This condition may be recognized by the difficulty and evidence of pain during defecation which occurs more frequently than usual; also by a mucous, bloody or purulent coating of the fæcal matter. Sometimes only small quantities of blood-stained mucus are pressed out. In case of doubt the disease can be diagnosed by certainty by the digital examination of the rectum or with a mirror. The treatment consists of a removal of the causes with the finger or with douches and of enemas or infusions of lukewarm, mucilaginous, demulcent fluids, such as flaxseed gruel, mucilage, thin starch paste, fatty oil, etc., or of astringents, such as solutions of alum, tannin, or silver nitrate (see above). A special treatment of tenesmus is seldom necessary. If something must be done then suppositories with extractum belladonnæ or opium could be prescribed, e. g.:

℞	Extracti Belladonnæ	0.2
	Olei Cacao	10.0

Fiant lege artis suppositoria No. iv.

On the other hand it is necessary to use cocain very carefully; with very young and small dogs even a dose of 0.025-0-05 used as a solution, ointment or suppository in the rectum, can produce not only severe symptoms of intoxication (poisoning) but even death.

The treatment of chronic catarrh of the bowel is practically the same as the acute. Catarrh of the rectum may be caused by an extension of the irritant from the intestines, but this condition is more apt to result from mechanical irritants, very hard fæces, sharp splinters of bone or wood, rectal parasites; in male puppies that are housed with other older animals, particularly stud dogs, the rectum of the younger dog is frequently greatly irritated by attempted copulation on the part of the older male. Proctitis is recognized by difficult and painful defecation and the passage of small quantities of fæces covered with mucus and frequently bloody. When making a diagnosis, the rectum can be examined by means of the fingers previously oiled and introduced into the rectum or by means of a rectal speculum. After removing the cause —hard fæces or a foreign body—inject into the rectum, by means of a clyster apparatus already described, a thin mixture of starch with a small amount of opium in it or alum or organic silver solution. Tincture of nux vomica is very useful as a tonic in one or two-drop doses, before meals, twice daily. The quantity of food requires special attention. Give easily digested food and of a character that will not produce a large amount of fæces; bones, fat, tendinous, fibrous meat must be avoided. In order to counteract the loss of strength, give small quantities of rare or raw meat, finely chopped, or scraped raw meat, carefully weighed raw ham, milk, egg, rice and under certain conditions also the various peptone preparations, or other concentrated foods (see later, Distemper). In young puppies the various infant foods so largely used in children practice are used as a substitute for milk. In persistent diarrhœa, give bismuth subgallate, subnitrate or salicylate. or the organic compounds of silver, if the tannic acid compounds fail. In rare cases, where we find constipation present, use a saturated solution of Glauber salt, in teaspoonful doses; milk of magnesia, or other laxative waters may also be given. This condition can, however, be combated best with rectal injections of warm water and oil. Any complication of the stomach will have to be treated by the method advised under Catarrh of the Stomach.

℞	Bismut. subnitric.	1.0
	Sacchar.	0.5

Misce et fiat pulvis d. tal. dos. No. viii.
S.—Two to three powders daily.

℞	Argent. nitric.	0.6
	Bal. alb.	10.0
	Aq. destillat. q. s.	

Misce et fiant pilulæ No. xxx.
D. S.—Give one pill 3 times daily.

The toxic and mycotic inflammations of the stomach which develops in part after the consumption of sharp, caustic substances and partly after consumption of decomposed food, will be described separately. In their milder forms these inflammations are generally recognized simply as stomach or intestinal catarrh.

Gastroenteritis toxica, toxic stomach and intestinal inflammation, toxic gastro-intestinal catarrh, is caused by the absorption of various poisons that produce violent local action, such as acids or irritating substances (lye, heavy metals, arsenic, phosphorus, etc.), which irrespective of their action upon the mouth, pharynx and œsophagus, produce hyperæmia, inflammation, ecchymoses, corrosion and abscesses in the stomach and intestines or also only a more severe inflammation of the mucous membrane of the stomach, and also by the excessive use of drastic purgatives, such as aloes, calomel, croton oil. If the poison is in the form of a solution the changes will usually begin in the mouth or throat and often only extend as far as into the stomach or only a short distance beyond; but if the drug should be slowly soluble, or in the powder form, or contained intimately mixed with some other substance, it may reach the small intestines or even the large intestines and the rectum.

The intensity of the disease depends on the amount of the drug taken and on the effect it has on the mucous membranes. The only result may be an attack of acute catarrh, with some loss of the epithelium of the mucous membrane, or there may be also a gangrenous destruction of the walls of the stomach. It is seldom that irritating agents get any further than that organ, wasting their strength there and changing the wall of the stomach into a blackened or tinder-like mass, and all the surrounding tissues are swollen and reddened by hyperæmia or hemorrhages.

We may safely conclude that we have a toxic gastro-enteritis to contend with when the symptoms of a serious gastric and intestinal catarrh appear suddenly, especially after eating, and if the grave symptoms increase rapidly and are accompanied by loss of appetite, salivation, vomiting, great restlessness, severe pains taking the nature of colic, pain on pressure on the abdomen, it is painful and greatly distended, the vomited matter and the passages from the intestines being mixed with mucus and blood, tenesmus, great weakness and small frequent pulse.

The therapeutics should be carried out vigorously. If the poison (this applies more or less to all poisonings) is presumed to be still in the stomach then the treatment consists, first, in giving an emetic, or using a stomach-pump or wash the stomach (see page 35) to remove the poison; on the other hand both of these methods are contraindicated if there has been severe corrosion of the stomach by caustic acids or lye because of the danger of perforation. If, however, there is reason to believe that the poison has partly made its way into the intestines then attempt to remove it by giving a laxative, an oleaginous one (olive oil or linseed oil) is the best, rectal injections of warm water, if there is much pain and irritation, and small quantities of opium can be given in the oil. For such intestinal injections and flushing, if the poison can be discovered, use the proper antidotes, which are given in the chapter on Poisoning.

Mycotic Inflammation of the Stomach and Intestines (Gastro-enteritis, Mycotic Decayed Meat Poisoning).—This is a variety of toxic inflammation, of the stomach and intestines. It is due to decayed meat poisoning. This is seen after the animal has eaten decomposed meat, offal or from drinking brine (Leisering), or eating cadavers of dogs or other animals that have died infected with bacteria, i. e., pus, septic metritis, mastitis, enteritis, nephritis; from drinking or licking the juices of decayed meat, putrified cheese, sausage; fish and all such matters that are filled with toxins and tox-albumens, developed from the micro-organisms such materials contain, also from drinking from stagnant ponds and bodies of water containing decayed substances, or cadavers. The disease results partly from the action of the microbes that originally cause the decomposition and decay but also from the poisons this produced. This condition is seen in all sorts and conditions of animals, most frequently in butcher dogs but also in the best fed and semi-starved, in the first from depraved appetite, due to indigestion. Even when they are well fed, they get into the habit, if they are allowed to roam in closely populated towns and villages, to go a regular route from one garbage pail to another and eat all sorts of decayed vegetable or animal matter. The susceptibility of individual animals varies greatly. The active agent has a toxic principle present in it. The symptoms of that form of poisoning are as follows: Vomiting of an amount of very offensive matter, rotten masses of meat and with it quantities of bad-smelling mucus and accompanied by violent, sometimes bloody, diarrhœa, intense thirst and high fever, 40 to 42° C. The writer has seen, however, instances where the temperature was subnormal, a small rapid pulse, great weakness, sunken eyes, often complete paralysis, great depression and indifference to surroundings. Death generally follows with every symptom of collapse in 15 to 24 hours. Other symptoms that may occur are muscular or intestinal cramp, great difficulty in swallowing, disturbance of sight, dilatation of the pupils, cramps, uncontrollable forced movements, hemorrhage of the omentum, paralysis, bloody urine.

When an animal makes a recovery, it is very weak for a long time, and it is almost impossible to get the animal to eat.

After death, the process of decomposition begins almost immediately, and if a post-mortem is to be held, it must be made as soon as possible. If this is done, the stomach and intestines will present an intense hemorhagic inflammation of their walls, swelling of the follicles and mesenteric glands, as well as severe inflammatory changes in the adjacent organs—liver, spleen, heart, etc.

The treatment has to be causal and symptomatic. In the beginning give an emetic (apomorphia) subcutaneously, washing out the stomach, between vomiting attacks, with warm water, to which may be added some salicylic acid or very weak solution of creolin, and follow this with the administration of purgatives, emulsions of castor, olive or linseed oil, and especially calomel, and tepid rectal injections of creolin, and massage the abdomen with alcohol or with reinforced mustard oil spirits (1 mustard oil, 20-30 alcohol) and apply a Priessnitz compress, with tepid water or flaxseed poultice. The bodily strength of the animal should be kept up, with stimulants, such as black coffee, wine, whiskey, or brandy, spirits of camphor. When there is great depression, spirits of camphor may be injected subcutaneously. Also a subcutaneous or intravenous injection of a sterile physiological salt solution may be beneficial. In mild cases we may treat them in certain lines as catarrh of the stomach and intestines. The animal should be fed on light foods, easily digestable, and in small quantities; no solid meat the first forty-eight hours.

Constipation—Costiveness

This condition may result, from the animal eating food that is difficult to digest, i. e., potatoes, bread, beans, peas, dog biscuit, corn flour, bones, particularly calf bones, and where the animal has little or no exercise, animal kept on the chain or penned in a small yard, hunting dogs that have worked hard during the open season and during spring and summer do nothing, old dogs that have weakened digestions, particularly if they have suffered from chronic intestinal catarrh (see under that heading), as well as in conjunction with all kinds of chronic diseases. Costiveness is also seen as a result of fever, rheumatism, peritonitis, catarrhal icterus, and diseases of the spine.

Obstipation

(Occlusio Intestini; Obturatio Intestini)

Constrictions of the intestinal tract may be formed in any region and may vary in degree. They always produce more or less obstructions to the passage of the alimentary matter, and when the constriction becomes complete, the intestinal contents, being unable to pass, usually return toward the stomach again, and are expelled by vomiting. In such cases the animals die quickly. This is noticed in very rare instances, where a hernia has strangulated and completely blocked up the canal. (For further details see chapter on Hernia.)

Constriction may be caused by abnormal conditions of the intestinal contents, from the alteration of the intestinal walls, by changes in the position of the intestines, and, lastly, from external pressure.

The bowel is often blocked up by masses of excrement, as a result of improper food or feeding which is not digested in the stomach or intestine; these collections reach the lower bowel and from the constant accumulations of excrement coming down from the small intestines gradually blocks up the entire tract. We also see obstructions, caused by pieces of wood or splinters of bone, that collect masses of fæces around them and fill up the bowel, forming intestinal stones or calculi (coproliths). These invariably have a nidus or center consisting of a marble, pieces of cork, sponge, or other foreign bodies, or it may be caused by large pieces of bone, stones, glass or metal balls, nuts, pieces of leather, etc., some of which may be swallowed accidentally in the case of trick dogs, or in play.

The constriction of the intestine, from being enclosed in a hernia and the impaction of the intestinal contents pressing into the part is frequently seen in the dog. The intestine frequently becomes twisted or knotted, or even invaginated. These complications, as a rule, occur in the small intestines. External compression of the intestines is frequently caused from enlarged prostate or sarcomas in the pelvic cavity, helminths or parasites that lie in cyst formations in the mucous membrane of the intestines. Sometimes enormous abscesses form in the abdominal cavity, and in rare instances they are caused by accumulations of fluids in the abdominal cavity, as in the case of ascites. In newly-born puppies we sometimes see a congenital obstruction of the rectum (atresia ani). Great masses of fæcal matter may accumulate in the anal pouch; this may be due in some cases to the swelling of the anal glands, or by the accumulation of masses of hair gluing around the rectum and preventing defaecation; the same condition is seen in tumors of the anus or rectum. For further details see page 45.

When a portion of the intestine becomes obstructed, the following changes take place: In front of the obstruction, an enlargement forms, due to the accumulation of gas and excrement matter, while the portion of the intestine beyond the obstruction is empty and constricted. The accumulation of gas and matter causes an intense inflammation of the mucous membranes, which extends to the muscular coat of the intestines and soon to the serous coat, and quickly the entire intestinal tract is involved in the inflammation, the constricted portion becomes mortified, and perforation follows, allowing the contents of the intestines to escape in the abdominal cavity, causing purulent peritonitis.

Clinical Symptoms of Constipation.—The symptoms and course of constipation are due to so many different causes that they will be described separately.

In mild cases of constipation the symptoms are not especially characteristic and resemble chronic catarrh of the stomach. At first the animal is noticed to defecate irregularly, the stools are smaller and passed apparently with more or less difficulty, which is especially noticeable, considering the stools are very much smaller than natural.

When from having little exercise and living on highly spiced foods (veal or game), or eating quantities of bone that they are unable to digest, great accumulation of fæcal matter gathers in the colon and rectum. The most marked symptom is the repeated attempts of the animal to defecate without any results or after great efforts only succeeding in passing a small quantity of fæces. These are coated with mucus or blood and are passed with more or less pain. The stools are small and are generally yellowish-brown in color, and in powder-like masses that break up easily, showing no moisture in them. The position of the tail is characteristic. It is carried either mostly stretched out or so as to form a curve at the rectum, the curve being from the base to one-half of the tail. The abdomen which is usually more or less taut, sometimes bloated tympanitically. On pressing the fingers into the sides of the abdomen, at the entrance of the pelvis up toward the spinal cord, we find an elongated sausage-like body (the large intestine filled with fæces), which is extremely sensitive to the touch. This hard mass is found to extend so far as the liver, sometimes also into the right side of the abdominal cavity, downward and forward toward the umbilicus. Occasionally it even happens that the entire large intestine is filled and distended with fæcal matter to such an extent that the layman might suspect abdominal dropsy or pregnancy. The latter was the case in the bitch in Fig. 38. The separate colon segments were equally dilated with an average circumference of 40.5 cm. The intestines are greatly swollen on account of the accumulation of gas and vomiting is sometimes present. On making an examination of the intestines by the hand, we may be able to detect the distention. The colon is at times found to be dilated, through its entire length, forming an enormous sac, filled with a putty-like mass; and during palpation the animal as a rule evinces pain and resists it. The examination with the finger, the manipulation, the animal's resistance being seriously disturbed through the severe pain connected with this, usually discloses the mucous membrane to be dry, hot and swollen; the fæcal mass located in the intestine can also usually be reached with the finger. This examination should be carefully made, as it may lead to the discovery of the original cause of the constipation. Slight diarrhœa may sometimes be present in severe constipation; this is due to the mass lying in a sac or pouch in the intestine, the firmer material gradually accumulating and the fluid fæces passing over the collected mass. As a rule the general condition of the dog is at first affected very little but later the animal shows signs of weariness, decline, and sometimes also slight fever. In case of complete obstruction of the intestinal tract the symptoms described below are evident. Long continued constipation (coprostasis) may cause infection of the blood from absorption of the fæcal matter, hemorrhagic and diphtheritic enteritis, mortification, peritonitis, perforation of the intestinal wall, and death.

Symptoms of Obstruction of the Intestines.—In complete occlusion of the intestines, due to foreign bodies, tumors, invagination or tortion, the animal sometimes is irritable and cross and Trasbot has seen cases where the animal showed symptoms very similar to rabies, suffer cramps or show symptoms which resemble the maniacal stage of rabies, or where it may present the other extreme, being dull and indifferent to the surroundings, refusing all food, but showing great thirst, with no passage of fæces whatever. The rectal temperature is normal or only very slightly increased, less often decreased or noticeably increased, the lower portion of the abdomen is inflated with gas and very painful, even on the slightest pressure; in some cases we may find decided icterus.

The vomiting is constant and very severe, particularly in the later stages of the disease, the animal vomiting whenever it drinks any water. At first the vomited matter is normal, but later on it assumes a greenish color (bile) and finally putrid, containing pieces of fæcal matter (miserere, ileus).

By examining the abdominal region with the hand we can generally locate the obstruction, which is hard and exceedingly painful on pressure. The swelling can be moved about showing it to be part of the intestine.

In ordinary cases of constriction of the intestines, no definite prognosis can be made with any degree of certainty as to its course and duration. The constriction of the intestine may go on gradually and not cause any serious symptoms for a long time, or it may progress very rapidly and cause a complete constriction in two or three weeks. Where the condition continues for some time, the animal becomes gradually weaker from day to day, loses flesh rapidly, pulse becomes more rapid and is smaller and finally imperceptible, the temperature may rise but frequently it remains normal, or after an initial increase in temperature at first the internal temperature gradually decreases, and in a few days the animal may die in a condition of collapse. The disease may run a slower course if a foreign body merely partially obstructs the intestinal tract but does not close it entirely; and often conditions improve or grow worse depending on the change of position of the object which is slowly, sometimes with pauses, passing through the intestines. A favorable termination may result, and foreign bodies, such as pieces of cork, bone or wood may be macerated and passed out finally without any great trouble. It is not difficult, as a rule, to detect the existence of a foreign body in the intestines, but it is very difficult to tell its exact nature. By means of palpation of the abdomen (see page 43) we may be able to detect

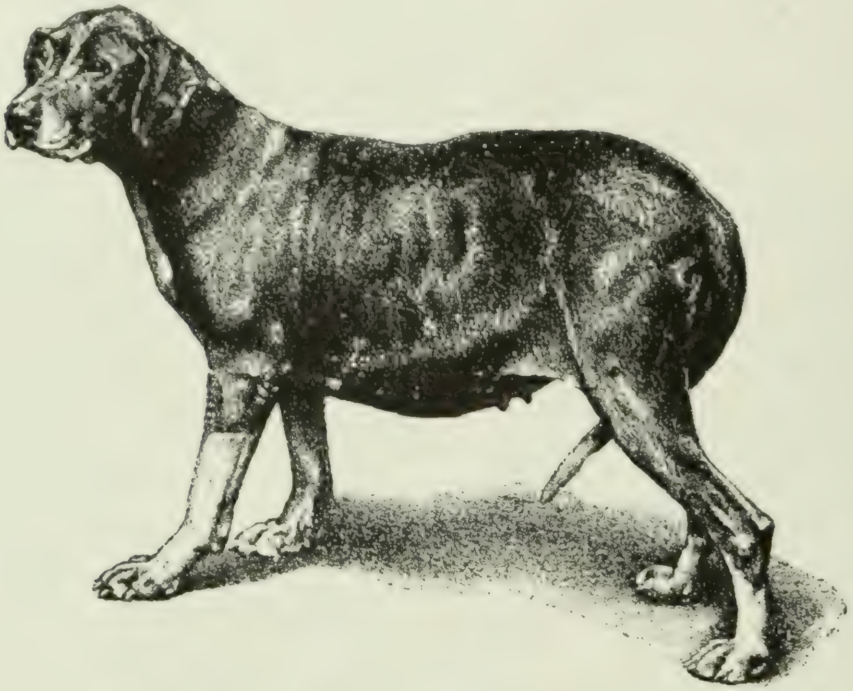


FIG. 38.—Dog with obstruction of the intestines.

hard, foreign bodies, or objects, such as hair balls, usually recognizing them in the form of a hard swelling which is painful when touched and generally movable; on the other hand soft foreign bodies and invagination or twisting of the intestines is, however, rather difficult to diagnose. Metallic objects, stones, etc., can be diagnosed by means of the Röntgen or X-ray, and in all other cases by performing laparotomy. Furthermore it is advisable in case of the sudden appearance of symptoms of complete obstruction of the intestinal tract never to neglect to examine carefully the accessible places for a possible hernia. Where the intestine is completely obstructed, in front of the obstructed portion, the intestine is greatly distended, due to the collection of fæces and gas, and the intestine immediately after the obstruction is contracted and empty. At the obstructed point there will be found great inflammation of the mucous membrane, which finally affects the muscular and serous coat and peritoneum (peritonitis), or the portion becomes necrosed and a purulent peritonitis follows and the animal at any of these stages may die of septicæmia.

Therapeutics.—In an ordinary case of constipation give plenty of exercise and a carefully regulated diet. If it is advisable to give the animal very little food for a few days, give plenty of water and small quantities of soup, either beef or vegetable. Later, during a more or less longer interim, and during their entire following period of life, in old animals, where digestion is more or less weakened, give easily digested food and including meat which is free from bone but no bones whatever. Clysters or mechanical laxatives, such as glycerine or soap suppositories, and massage of the abdomen is advised. As a laxative, oleum ricini (10-50.0 pure) in a capsule or emulsion, Glauber or Epsom salts, 10.0-25.0, Hunyadi Janos, or Apenta water, teaspoonful doses. Carlsbad salts, Electuarium e Senna (coffeespoon to tablespoonful), Tinctura rhei aquosa, Sirupus rhammi catharticæ (1-2 coffee or tablespoonfuls) and calomel (0.03 to 0.15); in very obstinate cases also croton oil (1-5 drops in oleum ricini), while the laxatives administered subcutaneously (physostigmin, pilocarpin, arecolin), as well as the chlarbarium administered intravenously are not suited for dogs.

When a case is very obstinate and does not respond to the previously advised treatment, especially where we find the large colon filled with fæces, and laxatives have no effect, the rectum must be emptied. The finger or a suitable instrument (corn tongs, pincers, bulb tongs, spoonhandle), after being well oiled, is introduced into the anus where there will be found hard faecal masses in front of the sphincter. It is generally impossible to remove them, except by breaking them up, either with the finger or having first injected a small quantity of oil or glycerine into the rectum, or the handle of a spoon can be used to break up the masses, taking care not to injure the mucous membrane. This is to be followed by the injection of the clysters by means of the hose and funnel (see Fig. 39). The lower part of the bowel is filled with a combination of lukewarm water and a small quantity of oil (olive oil, linseed oil, rape oil) by means of a rubber hose and funnel while ordinary clysters, especially glycerine clysters and soap suppositories, cannot be recommended in case of large accumulations of fæces because of

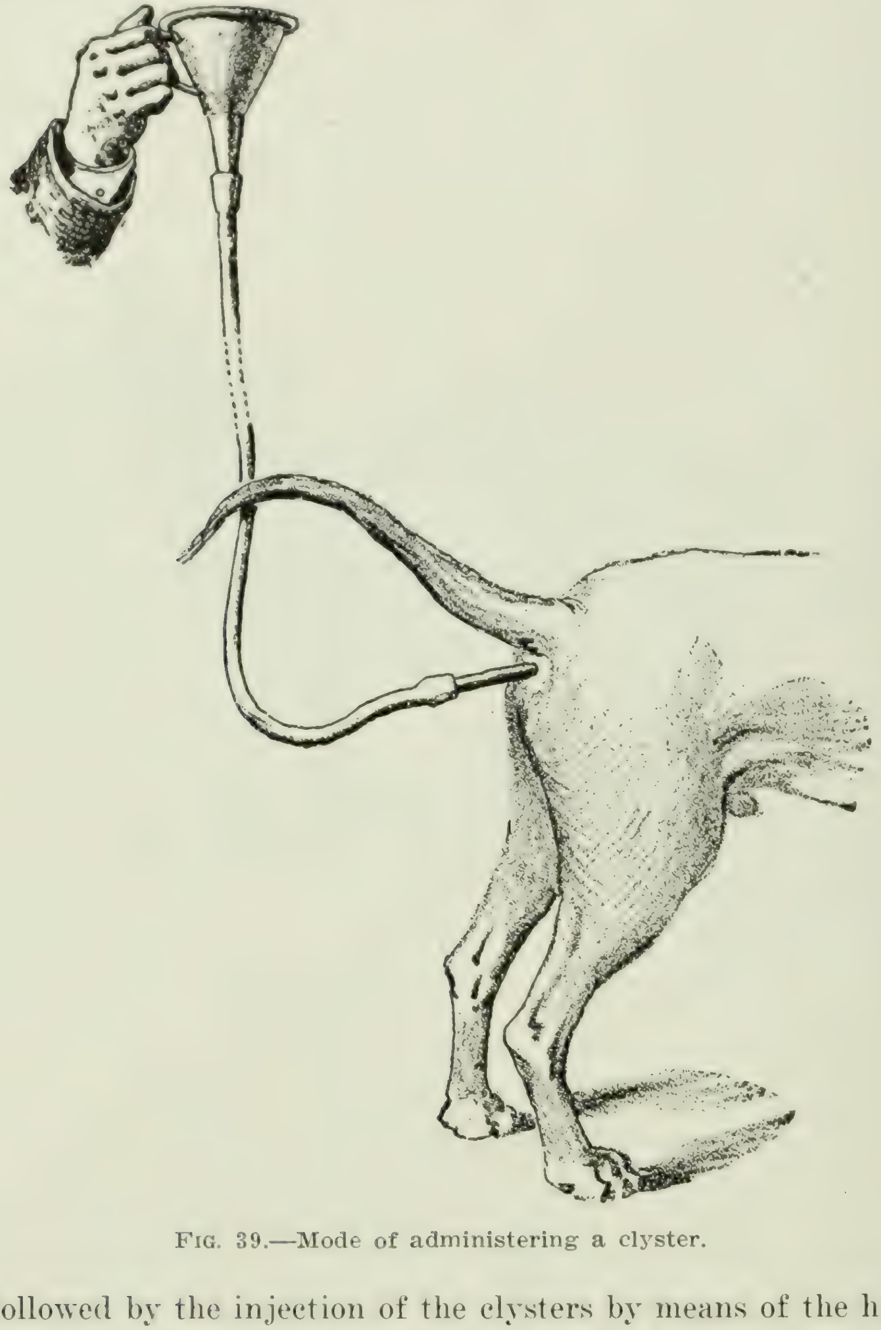


FIG. 39.—Mode of administering a clyster.

their mild action. By alternately raising the front part and then the rear part of the patient's body during the injection the effect can be considerably increased. These clysters should be repeated frequently, at least several times a day, or even several days, until the whole canal is emptied. Or what is better, glycerine suppositories, and later on administer a sharp purgative, followed by the administration of drop-doses of tincture of nux vomica.

Copious salt water injections, consisting of a one per cent solution of salt, is allowed to flow into the intestine by natural gravitation as is seen in Fig. 39. From one to three liters are used according to the size of the animal; when the animal shows signs of emesis the abdomen should be manipulated and the greater quantity of the fluid worked out the intestine; this should be followed by teaspoonful doses of medicinal liquid paraffin twice daily for several days.

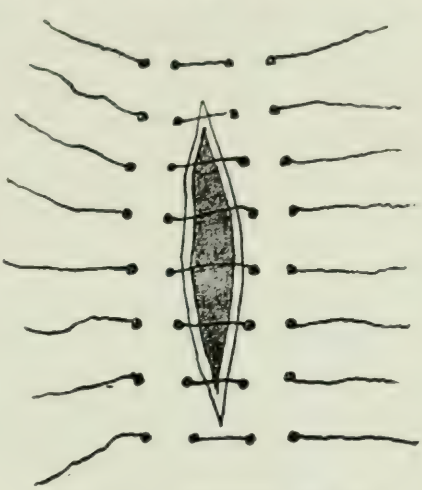


FIG. 40.—Lambert suture.

The subcutaneous injection of such drugs as physostigmin, pilocarpine, arecoline, barium chloride, ichthlargan, tallianine are not advised, their results are at tnmes actually dangerous to the animal. These latter drugs are administered by intravenous injection into the saphena vein. The vein is dilated by means of pressure and when filled, the hypodermic needle is thrust into it, taking care the needle punctures the vein, which will be indicated by a few drops of blood coming from the needle and continuing to drop as long as the pressure is kept on the vein. If it is the cellular tissue no venous blood escapes. The injection is made and the opening closed with collodion. As in the case in strangulated hernia, or in the case of accumulation of the fæces in the rectum, due to fæcal stagnation, or from the ulceration of abscesses of the rectum, we will have to treat them as described above; but we may add to that the injection of large quantities of soapy water several times daily, which can be given with the apparatus illustrated in Fig. 39, and a dose of calomel followed by castor or olive oil or glycerine injections into the rectum, or suppositories in the form of glycerine, or a solution of glycerine and water 1 to 10.

The stenosis of the bowel that is caused by the impaction of foreign bodies is best treated with laxatives (oleum ricini or a mixture of oleum ricini and olive oil, given in frequent small doses), and rectal injections especially of oil, and not with purgatives. Vogel and others advise in the case of sharp or pointed objects, to feed the animal on thin liquid foods, soups of peas and vegetables, but if we do not succeed in getting rid of the foreign body and, if a positive diagnosis has been made, it is best to perform laparo-enterotomy as soon as possible, and not wait until gangrene and peritonitis have set in.

Laparo-enterotomy is performed in the following manner: The animal is anæsthetized and placed on its back, the lower part of the abdominal wall shaved and washed with antiseptics. Make an incision, through the linea alba, posterior to the umbilicus, back to the margin of the pubis about 5 to 8 cm. long. First cut through the skin, then the muscles. Before going into the abdominal cavity, all the hemorrhage must be checked and the blood cleaned off, and then with the thumb and index finger go into the abdominal cavity and, having located the portion of the intestine wanted (containing the foreign body), pull it through the opening and hold the lips of the wound together; an assistant can hold the edges of the wound together and prevent the rest of the intestines from escaping, and also to prevent possible infection from the escaping fluids, when the incision is made in the intestine. As this is a rather unreliable method it is better to tie off the intestine in front of and behind the foreign body by means of silk ligatures or even to tie, rather firmly, a strip of sterile muslin around the base of the intestinal loop lying outside the incision. The latter can also serve to absorb the intestinal contents that may seep out after the intestine has been opened; this can also be accomplished by placing layers of muslin or absorbent cotton around the base of the intestinal loop. Make the cut longitudinally, on the intestinal line, on the opposite side from the mesentery, remove the foreign body, taking care all through the operation to prevent the fluids escaping into the abdominal cavity. Wash the inside of the intestines with an antiseptic (boric acid solution) and unite it by means of Lambert's suture (see Fig. 40) or Czerny's double suture (see Fig. 41). If the intestine at the point of obstruction is no longer viable then resection of the affected part is considered after which the two ends of the intestinal tract are united by means of the Lambert's serous suture. For more exact detail on this subject, the reader is referred to the works on canine surgery by French or Hobday. The operator now takes a fine curved needle, and fine cat-gut suture and puts a number of stitches through the mucous membrane and serous tissues, taking care not to go through the mucous membrane, so that when the thread is tightened the two edges of the cut will be brought so as to face into the intestine; these are tied, and another line of stitches is made over the first, as is illustrated in the accompanying Fig. 41. The intestine is returned to the cavity, and the external wound sewed up with silk and dressed with an antiseptic dressing bound around the abdomen. In the male dog see that the dressing is not soiled with urine.

The opening of the abdominal cavity is also to be performed in cases where we can recognize a total constriction of the bowels. In these cases where the anatomical cause of the disease cannot be clearly established, we have no other way to proceed than to treat the symptoms as they present themselves, that is, to give purgatives, or, in any case, do not neglect to give plenty of watery clysters. The general treatment must be directed toward keeping up the animal's strength. The first forty-eight hours only tepid water must be given and in small quantities. Subcutaneous injections of the spirits of camphor or ether are better than administering them by the mouth, as they are vomited immediately. Do not give the animal any food until the intestinal obstruction has been removed or at least until there have been free defecation and the passage of the intestinal gas and the general condition is improved. And on the third day the animal may be given food; it must be of the lightest and easiest digested, such as soups, milk, bouillon with egg, meat, peptone, and on and after the fourth day finely scraped rare or raw beef, or some of the various foods used as substitutes for milk. Where the animal is subject to fæcal obstructions, it is well never to let him have bones if it can possibly be avoided.

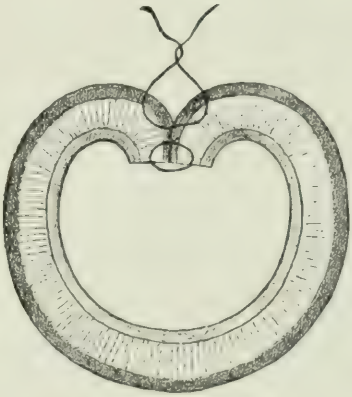


FIG. 41.—Suture of the intestines (*Czerny*).

Intestinal invagination occurs as a result of irregular or extraordinary peristalsis, particularly when the intestinal wall is in a relaxed, debilitated condition, as a result of intestinal catarrh from prolonged administration of laxatives or worm treatment. Death as a rule occurs from the fifth to tenth day. The symptoms of invagination are those of occlusion of the intestines (see above), and more or less blood on the fæces. Occasionally tenesmus, and sometimes passage of small amounts of bloody evil-smelling mucus or faeces are observed. We may be able by palpation to detect the invaginated portion by feeling a circumscribed elastic, elongated, sausage-like portion along the intestinal tract. This is extremely painful on pressure. The treatment may consist of administering a sedative (morphine) and copious intestinal injections (warm water or oil). Laxatives are not to be given. If this treatment does not produce satisfactory results then perform laparotomy, reduce the invagination by lifting out the loop of intestine and reducing the invagination, but if the irritation is too great, or necrosis has developed, perform enterectomy, excising the entire section of the intestine and reuniting the ends by suture. See further on under Enterectomy. One case of torsion of the large intestine was determined by Otto through operation. The dog had died over night after having been absolutely well the day before and had only vomited once. The entire large intestine (colon) with the mesentery had been twisted over a length of 25 cm.; the twisted part continued as far as the cæcum. The cause could not be established.

Chronic Constipation.—This is seen occasionally in the dog. It is due to a weakened or lessened peristaltic action of the bowels. It is seen in all chronic diseases that are accompanied by emaciation and debility, as in chronic catarrh, fevers, icterus, chronic peritonitis and in many diseases of the nervous system; but it may be observed in many old but healthy dogs, caused by an atrophy of the mucous and muscular membranes of the intestines. This disease is frequently called chronic obstipation, for it causes a form of constipation which would, as can be readily understood, cause just such a train of symptoms as has been described above.

These animals should be fed on non-stimulating, easily digested food with or without the admixture of vegetable soup, and also plenty of exercise and small doses of tincture of nux vomica. This treatment is far better than the frequent administration of purgatives, especially Glauber salt, jalap or aloes and cathartic pills.

Enterectomy, Entero-anastomosis.—This operation becomes necessary when a portion of the intestine becomes necrosed or where stenosis of a certain portion causes accumulation of fæcal matter anterior to the contraction. The operation is only possible where there is a small section of the intestine to be removed, as a section of any amount is apt, if the animal makes a recovery, to be followed very quickly by marasmus and terminate fatally in a very short time.

French has devised a very simple mode of operation, the technique of which has proved very efficacious in the writer's hands. It is as follows: The animal is put under ether after the familiar antiseptic precautions are used, cut down on the abdominal wall and having exposed the necrosed or the stenosed portion, as the case may be, and very carefully inspect the mesenteric blood supply, as great care has to be taken not to ligate any vessel that would supply any but the portion removed.

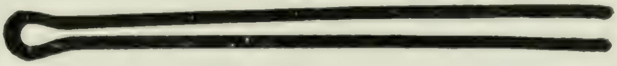


Fig. 42.—Hairpin method of anastomosis, showing the manner in which the pin is bent (*French*).

The vessels are ligated by means of a curved needle being passed around them through the mesentery, the anastomosing loop of the blood vessel being taken up as close to the point of incision as possible. Then an ordinary lady's hairpin, bent as in the accompanying cut (Fig. 42), is taken and one prong is passed transversely across the intestine and the free ends of the pin are seized by a pair of hemostatic forceps or tied with sutures, and another pin is inserted in a similar manner at the other point of resection; this point of the operation is illustrated in Fig. 43. The intestine is now cut close to the pins, and the mesentery cut as shown in the dotted line, the severed ends with the pins brought together and the pins tied or held by forceps both top and bottom (Fig. 44), and the suture is commenced at the mesentery, putting in the Lam-

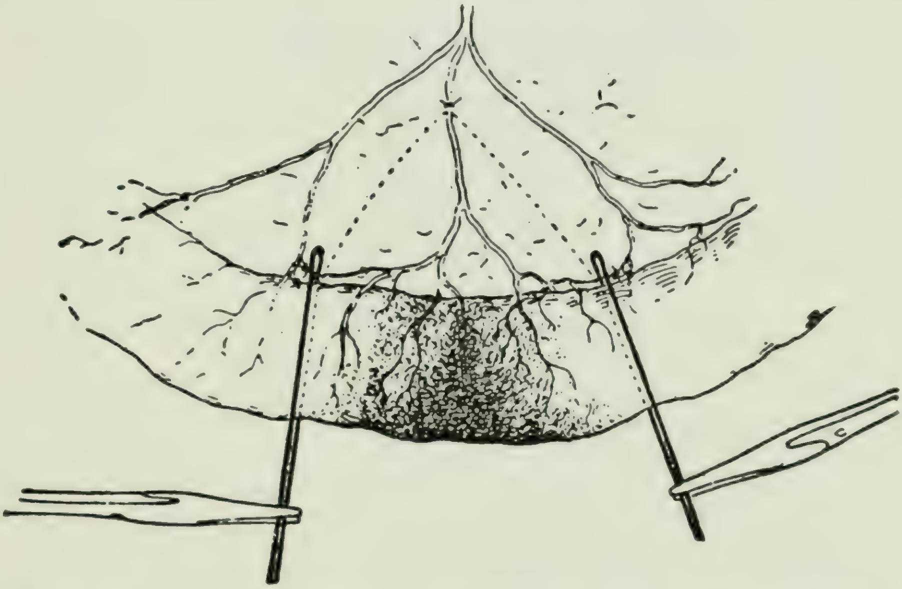


Fig. 43.—Hairpain method of anastomosis, first stage (*French*).

bert stitch on one side, then turn over the intestine and stitch the other side. The stitching is to be done very carefully and evenly, as on this depends the adhesion of the anastomosis. French recommends the ordinary milliner's instead of the surgical needle, as it makes a cylindrical hole that has no ragged edge and the opening adapts itself to the suture, preventing hemorrhage or leakage; the tops of the pins are now cut off by means of a pair of wire-cutters and withdrawn, one at a time, and the two openings left by the pins are sutured; great care is to be taken to keep the margins of the mesentery in apposition; the cut in the mesentery is now closed by means of a continuous suture. The after-treatment consists in keeping the animal on a strict liquid diet, juice of meat, clear soup, or bouillon for at least a week or ten days.

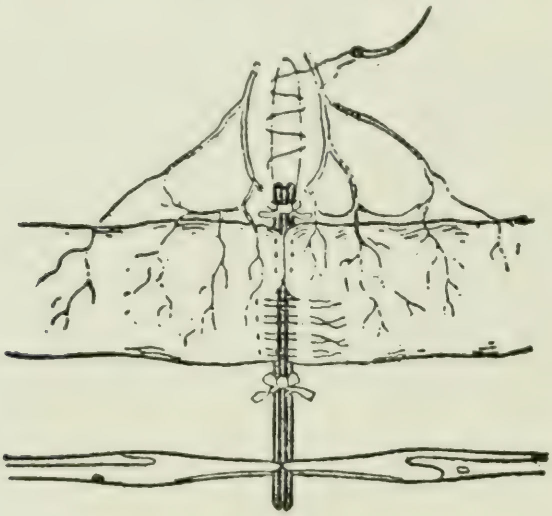


FIG. 44.—Hairpin method of anastomosis, second stage (*French*).

Prolapsus of the Rectum

(Prolapsus Recti et Ani)

Etiology and Pathological Anatomy.—The lower bowel is kept in place by the peri-proctal connective tissue, the rectal ring, the levator ani and the sphincter ani. By relaxing or distending these supports, we find a prolapsus of the mucous membrane, or even the entire rectum may be protruded (prolapsus recti), or a certain portion of the intestine may become invaginated and only the invaginated portion protrude (prolapsus recti cum invagionatione) or the prolapsed intestine may cause a rectal hernia (hernia recti rectocele). If this prolapsus is not relieved soon, it inflames very quickly and becomes torn and ulcerated, forming a great swelling. It may become strangulated, and in rare cases gangrenous. It generally results from a relaxed condition of the rectal mucous membrane or from excessive straining, from constipation, diarrhœa, or labor pains, from the continued use of hot or irritating clysters, from constitutional weakness of the sphincters and the peri-proctal connective tissues. It frequently occurs in young dogs that have catarrh of the lower bowel or as an accompaniment to distemper.

Symptoms.—These depend upon the degree of the prolapsus. If it is only a prolapsus ani, then the mucous membrane is slightly protruded, and it is only noticed during defecation or urination. It is seen in the form of dark red wrinkles that protrude from the rectum, and then after the straining and pressure have ceased often disappear of their own accord as soon as the abdominal pressure has ceased. If the whole bowel is prolapsed, we find under the tail a cylindrical projection, which protrudes from where the anus was, and hangs downward. The mucous membrane covering the prolapse that is exposed is wrinkled and con-

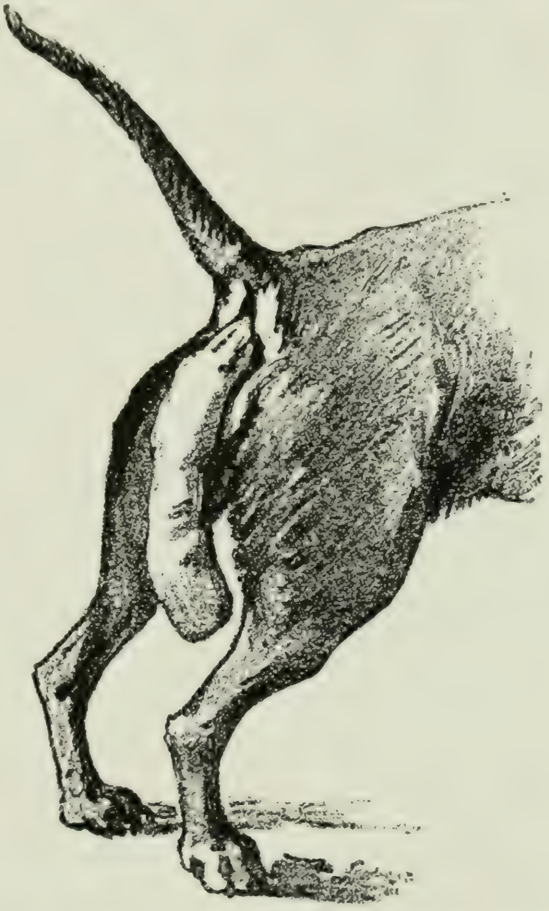
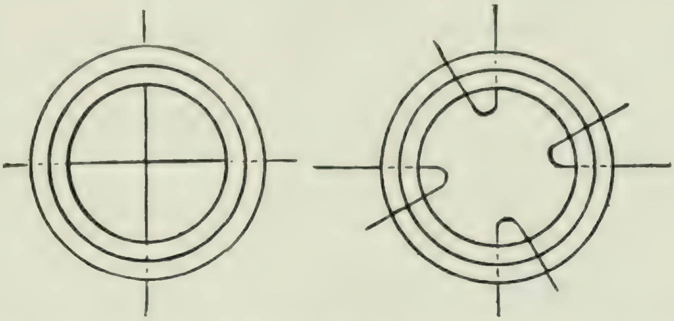


FIG. 45.—Prolapsus of the rectum with invagination.

gested, and at the center of the dependent (free) portion a slit-like opening is seen; this is the opening of the intestine. Through this we can introduce the finger into the intestine. At the anterior end, the mucous membrane passes directly into the skin and the anal opening. If there is any invagination, as is usually the case in a prolapse that protrudes very far, the membrane does not terminate at the anus, but seems to go into the rectum, and the protrusion which sometimes protrudes from the anus for a half meter, can be lifted up and the finger can be passed into the rectum between the swelling and the rectum (see Fig. 45).

Therapeutics.—The first thing to do is to remove the cause, whether it be due to diarrhœa or constipation, by putting the animal under treatment suitable for such conditions. The most important thing to do is to reduce the prolapsus as soon as possible, after first cleansing it. In case of prolapsus ani hardly any difficulties worth mentioning are encountered; in case of prolapsus recti it is usually necessary to place the dog on his front legs and elevate the hind ones, and having cleaned and oiled the inflamed portion, return it to its normal position and fill it with astringent solution, and if it is a long-standing case, opium in suppository or 5 per cent solution cocaine. If the mucous membrane is very much swollen and inflamed, it is best to scarify it slightly. If the folds of the mucous membrane are blackened and necrosed from prolonged exposure, they must be trimmed off with the scissors. The writer has generally succeeded, even in very bad cases, in reducing the protrusions by bathing them with cold water or by compressing the protruded intestine on the rubber band, or muslin bandages dipped in cold water or solutions of alum or aluminum acetate, commencing at the external end and winding toward the base of the swelling and while it is reduced by the pressure return it to its normal position. It is much more difficult to reduce an invaginated intestine, as the more you press on the protruded portion the more it packs into the end of the rectum. A large bougie or candle is inserted in the end of the protruded portion, and then it is pressed into its natural position. The invagination cannot be considered as having been corrected until the outermost end of the prolapse has been brought forward at least to a distance of twice its own length (Möller). Or if this does not succeed, perform laparotomy and draw the invaginated intestine back into position from the abdominal cavity. There is little danger from this operation, if it is performed with ordinary caution. A recurrence can only take place if the intestine becomes attached to the parietal peritoneum (rectopexie). It is not always easy to overcome the difficulties accompanying the execution of this operation and the necessary subsequent treatment. The administration of a hypodermic injection of morphia will insure relaxation and less straining on the part of the animal.

Precautions should be taken after replacement to avoid a recurrence of the prolapse. In new cases this can generally be accomplished if the animal is kept in a position with the rear part of the body elevated for some time after the replacement has been accomplished. In case of great straining on the part of the animal to defecate, a mucilaginous or oily clyster, with or without the addition of tincture of opium, can be administered. Salves and suppositories containing opium, belladonna extract or cocaine are recommended. If these measures fail or for some reason cannot be applied then the anus must be closed with circumventing sutures for a while.



FIGS. 46 and 47.—Method of suturing in amputation of the lower bowel.

After replacing the intestine, it is necessary to place a stitch around the perineum, so as to prevent the recurrence of the protrusion. What is called a tobacco pouch stitch is carried around the anus, and when the strings are drawn it will be seen (as in the cut, Figs. 48 and 49) that it prevents a recurrence of the protrusion by drawing the anus together. The sewing of the rectum by this stitch closes up the opening sufficiently to prevent the bowel coming out, but not enough to prevent the escape of liquid fæcal matter. Furthermore, every time that the dog shows desires to defecate the loop can be loosened and then drawn tight again after defecation. It is not advisable to apply cold irrigations or inject astringents, as the dog is very apt to strain more violently after application of either of these remedies.

At the same time, if the trouble is caused by diarrhœa, give opium, and if caused by constipation, administer saline purgatives. Stockfelt advised that a series of pins should be placed around the rectum and united with threads, and thus produce a greater constriction from the cicatrix when the irritation heals, so as to hold the parts in position.

Gray made an opening on the median line of the abdomen and drew back the intestine and stitched it to the opening with cat-gut sutures, taking care not to put the stitch through into the mucous membrane of the intestine.

When the prolapsus has been of long duration and reduction seems impossible, it is best to take means to remove the protruded portion of the intestines.

This is done by suturing off or amputation by means of a continuous suture. It is dangerous to attempt to tie off the prolapsed portion above a tin or hard rubber tube inserted into the rectum as far as the anus because the tube tends to irritate and cause straining and might be pushed off before a firm union below the point where the tying was done had taken place.

Amputation and Sewing by Means of the Double Suture.—Cut off the hair from the region of the anus, then wash the affected parts and region, with an antiseptic, put the animal under ether, the animal is laid on a table, the posterior part of the body is elevated, the prolapsed portion pulled out by means of forceps until normal mucous membrane is seen. Then wash off and apply a rubber band tourniquet as close up to the anus as possible, then a curved needle is passed through both layers, first from the outside to the inside, then again at a distance of about 1 cm. from the inside to the outside pulling the strong silk thread through, and brought up to the surface. This is facilitated by inserting an ordinary thermometer into the lumen of the intestine (Hobday) or, better still, a cylinder of carrot (Viborg). Tie this stitch and put another stitch beside this, and continue around the intestine until the base of the prolapsed anus is stitched up. Cut off the portion posterior to the stitches, but not too closely to the line of suture, remove portion of carrot and push the stump back through the anus. The suturing can be accomplished to better advantage if the prolapsed intestine is split longitudinally. Some recommend the so-called ''cobbler's suture'' (with cross stitches) in place of the single ligatures.

Amputation by Means of a Cross Suture.—The method advocated by Möller is performed in the following manner: The animal is etherized and the hair removed, the skin cleaned and two needles with linen or silk suture put crosswise, as in Figs. 46 and 47, through the prolapsed portion close back of the anus, the portion about 1-2 cm. posterior to the stitch, is cut off; the stitches are then pulled out from the lumen of the intestine and cut in the center, thus making four threads. These should be tied, as in the second figure of the cut, thus holding together the portions of the intestines opposite one another. If in exceptional cases the number of these ligatures seems insufficient, extra button sutures can be taken between the first ones.

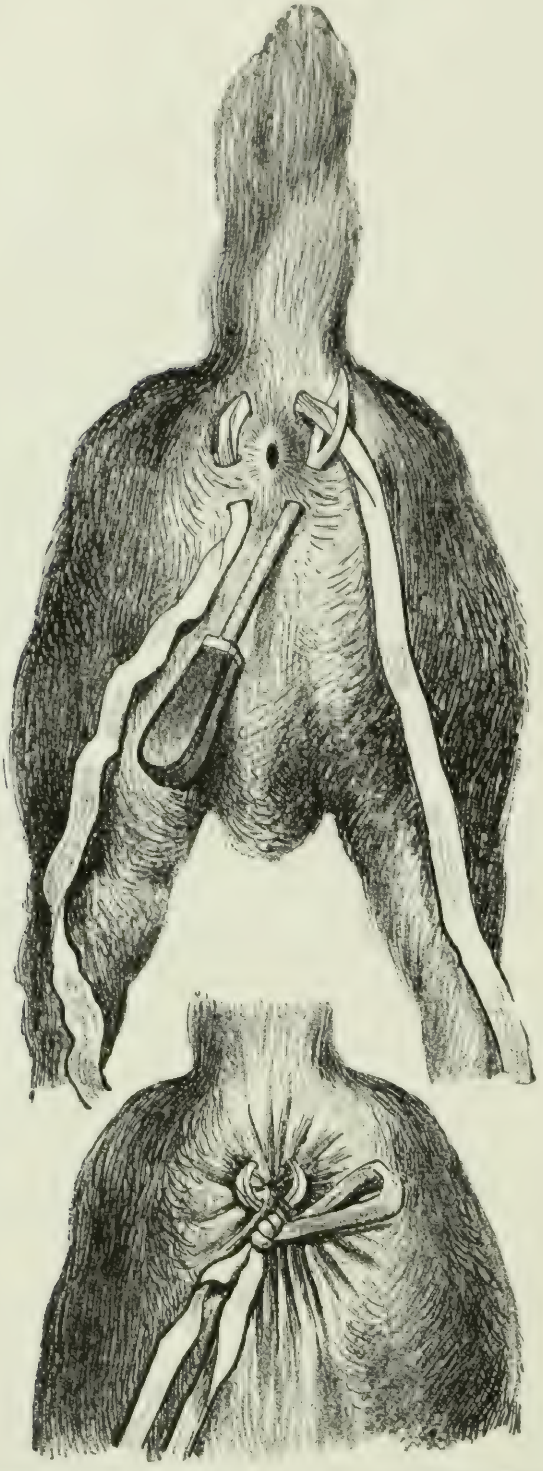
Another method is to place the animal under ether, and having laid it on a table with the posterior extremities elevated, the prolapsed portion is pulled so far as possible out of the rectum. It must then be rubbed in the hands, to remove as much blood from it as possible, or a rubber band wound around it, from its extremity to its base, and finally ligated at its base, and then, by means of a bistoury, the protrusion is cut off about one-half of an inch from the ligation.

After the blood vessels have been taken up by means of an interrupted stitch (the interrupted stitch is much better, as it makes the union of the lips of the wound much closer), sew up the serous membrane, and afterward sew the muscular and mucous membranes; the rubber band is removed, and the stump is pushed back into the opening. The treatment following both operations consists of regulating the diet and assisting defecation.

Malformations of the Rectum and Anus

Numerous malformations occur in the rectum; projecting polypus formations of the mucous membrane of the lower bowel may project from the rectum constantly, or may only be seen during defecation. We may also find fibroma, adenoma, carcinoma, and other forms of tumors. The writer had a particularly interesting case in a small dog that was quite old. The owner had observed a slight bleeding from the rectum for at least a year; the rectum was examined by means of a speculum and a carcinoma was found. It was located about 5 cm. from anus on the superior portion of the rectum. This tumor had hard raised irregular edges and depressed in the middle. In the peri-procal connective tissue, we occasionally find adenoma, sarcoma and carcinoma. These growths as well as those actually of the rectum, are apt to cause considerable trouble, as they cause constriction or complete obstruction of the rectum and interfere with defecation.

In the anus, we find several types of tumors which we class, in a general way, as anal cancers. They may either be adenomas or carcinomas and, as a rule, present rough, uneven, mushroom or fungus-like bodies growing firmly in the skin tissue itself, but having only slight attachment to the connective tissue. Generally they are firm, or slightly elastic, often ulcerous, and when they reach a certain size, they are very slightly attached at their outer edge, and the majority of them can be lifted from their base.



FIGS. 48 and 49.—Tobacco pouch suture; above, inserting suture: below, closing up suture.

When they reach considerable size, or, as is more often the case, increase in number, they are apt to interfere very much with defecation. The treatment of such growths can only consist of an operation. These tumors are easily removed, particularly when they have reached a certain size. The only precaution to be observed is to remove the tumor in its entirety and to avoid injuring the sphincter or the rectum, which would be apt to result either in paralysis of the sphincter or a rectal fistula. Deeply seated rectal tumors must generally be considered as incurable, since the operation cannot be followed by the requisite subsequent treatment, so that sooner or later the symptoms and results of complete intestinal obstruction appear. Frick advises early removal of tumors from the interior of the rectum. For information of the disease of the rectum see page 114.

Imperforate Anus, Inflammation of the Anal Pouches

(Diverticulum of the Rectum and Hemorrhoids are classed under this Heading)

Imperforate Anus (Atresia Ani and Atresia Ani et Recti).—This is a congenital deformity and consists of a defective formaton of the rectum and in some cases of the lower bowel. It is seen in newly-born puppies, and it is usually confined to the cutaneous covering growing over the anus (atresia ani), or it may be the rectum is only partially developed and it ends in a blind sac some distance from the rectum (atresia ani et recti). In these cases, the fæces are not passed and an artificial opening must be made. The treatment in atresia ani is to cut the skin in a cross incision with a small knife, and the edge of the wound sewed back, so as to prevent it from uniting again; but if it is found that the lower bowel is entirely occluded, it is better to destroy the puppy. But if treatment is to be tried as in a particularly valuable puppy, we can make a cross incision and by means of the index finger we locate the blind end of the floating colon; then, by means of the forceps, draw it to the surface, stitch the edges around the anal opening, as in an ordinary wound, and then open it with a vertical incision.

Inflammation of the Anal Pouches.—These glands (two blind sacs about the size of hazel nuts or walnuts) are located on both sides of the anus, lying between the anus and the mucous membrane. The interior of the pouch is filled with tubular shaped glandular tissue, ending in a short thin canal, near the anal opening (see Fig. 50). The secretion of the gland is a dark gray, mucilaginous fluid, with a very unpleasant odor and an acid reaction. From a variety of causes, such as local irritation, the accumulation of hard fæces, splinters of bone, etc., and from various irritations of the rectum, these glands become inflamed and the anus becomes swollen, on one or both sides, generally the latter. The region is warm, very red, painful to the touch, and there is more or less fluctuation in the swellings. The animal makes repeated attempts at defecation and there is every evidence of tenesmus. The animal is continually licking the anus and pulling and sliding the hind quarters on the ground. On pressing the swellings between the fingers, the contents of the anal pouches are emptied and are expelled from the anus; this is a thick yellowish-brown liquid, often stained with blood, and it has a very fœtid odor. In some instances the swelling breaks through the skin at the anus, forming an anal fistula, rarely peri-proctal abscesses or rectal fistulæ.

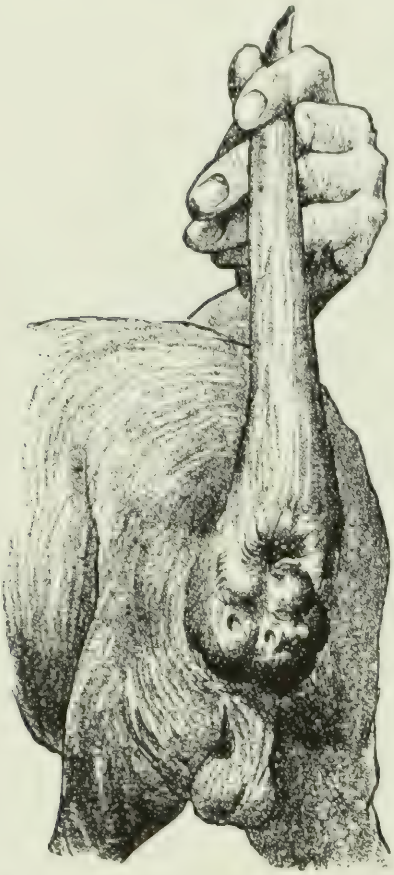


FIG. 50.—Inflammation of the anal glands.

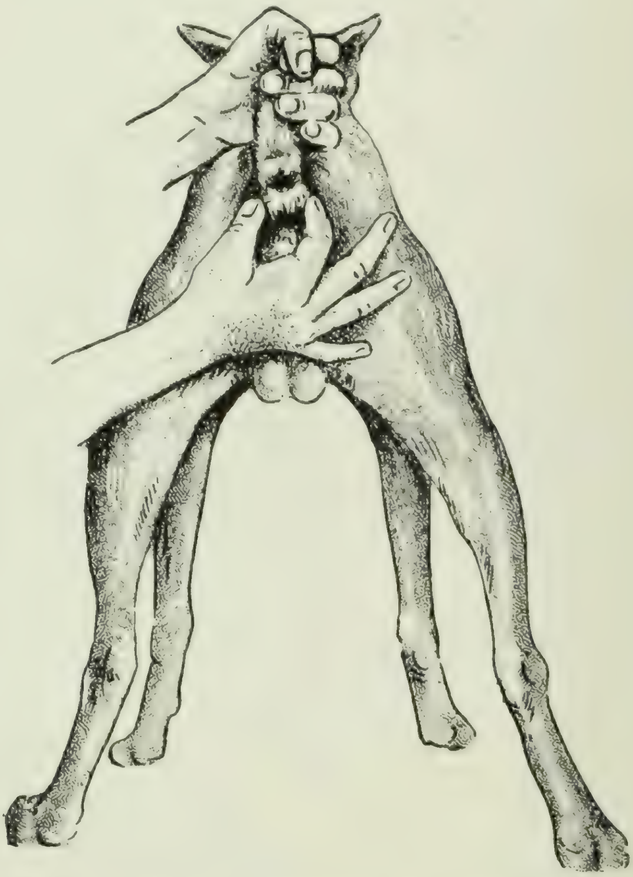


FIG. 51.—Mode of emptying the anal pouches.

The treatment consists in pressing the engorged glandular tissue between the fingers, either the two fingers externally, or putting the index finger into the rectum, and pressing on the pouches, which can be plainly felt and pressed upon toward the outside and exerting pressure against it with the thumb from the outside (Fig. 51). A recurrence of this condition can usually be avoided if a suitable suppository is inserted into the rectum. If they cannot be emptied in this manner, they must be opened by means of a curved bistoury, by a vertical incision, then cauterized, or burned or curetted with a sharp "spoon." Opening merely by lancing seldom suffices; by painting afterwards with resinous tinctures or tincture of iodine gives satisfactory results only very slowly. Gutman injects tincture of iodine into the gland. In rare instances it is necessary to curette the pouches. The general condition may be assisted by laxatives, to assist in easier defecation. In case of dogs that are inclined to suffer from inflammation of anal glands the defecation should be made easier by giving a diet that will produce regular, soft fæces.

℞	Chrysarobini		0.06
	Airoli		
	Extr. belladonnæ	āā	0.01
	Olei Cacao q. s.		
	M. f. suppository.		

Abscess of the Anal Glands.—The anal glands (acinos gland), which are situated in the sphincter, forming the anus, become inflamed and cause a swelling of the entire neighborhood of the anus, or develop many small abscesses which after breaking puncture the anal region with sieve-like perforations, either of these conditions causing great interference with defecation. These generally form pus, fluctuate and break. The treatment consists in first washing the anal region with cold water, Goulard solution, aluminum acetate, followed by warm fomentations, especially sitz baths, then in opening the abscesses by squeezing, and treating them antiseptically, oiling the anus, etc.

Diverticulum of the Rectum; Pseudo-perineal Hernia.—From the frequent accumulation of fæces in the rectum, particularly in old animals, the terminal portion of the floating colon and rectum becomes dilated and forms a sac, and when this diverticulum becomes filled, the neighboring structures are pushed out, and the condition may be mistaken for perineal hernia (Fig. 52). It can be differentiated from hernia by the fact that in this case the tumor is hard and putty-like and upon introducing the finger into the rectum it is found to be filled with hard fæcal matter. The treatment consists in breaking up the fæcal matter and removing it either with the finger, instruments, or by means of clysters, gluten or glycerine suppositories, giving the animal food suitable for this condition. Lienaux operated by cutting the rectum, pulling out all the dilated portion, excising it, and sewing the intestine to the anus as in prolapsus of the rectum. Ordinarily an operative treatment (removal of a piece of the rectal wall) does not give promise of successful results.

Hemorrhoids

These are diffuse or knot-shaped (varicose) distentions of the posterior veins of the lower bowel at the anus and, as it seems, seldom occur in dogs. According to their position, we may call them external or internal hemorrhoids.

The former are located outside the sphincter ani and in the subcutaneous connective tissue. The latter are located inside the sphincter the time, and often the fæces are covered with mucous when they are passed. It is not a rare affection in older dogs.

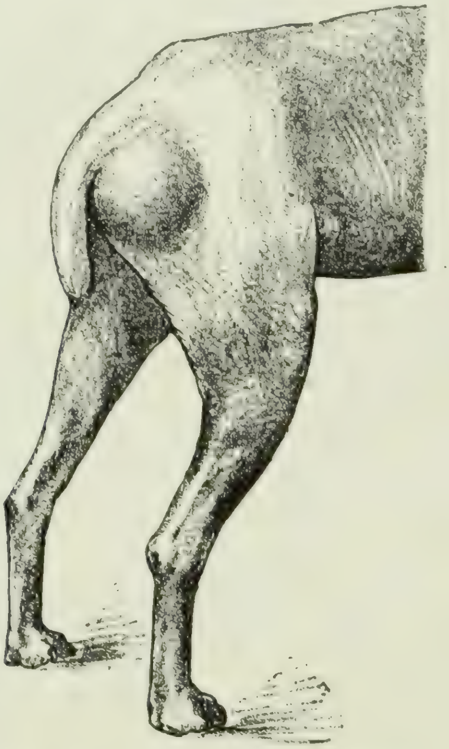


FIG. 52.—Pseudo-perineal hernia.

Clinical Symptoms.—The act of defecation is painful, the fæces covered with mucus and sometimes blood—either pure blood or blood and under the mucous membrane. Sometimes these enlarged veins burst and cause considerable hemorrhage. This, however, rarely amounts to anything, as the mucous membrane is generally more or less inflamed all and mucus mixed. On making a digital examination, which is very painful, the mucous membrane is found to be roughened and uneven, or we may see knotty lumps in the orifice of the anus. In rare instances they appear as bluish-red ulcers which encircle the reddened rectum. The animal is nervous, irritable, symptoms resembling those of rabies, sliding the posterior part of the body on the floor, especially on the carpet, so as to rub the rectum, and licking the anus frequently.

The causes can generally be ascribed to a stagnation of the veins, from irritation of the membranes, from bile or irritants due to poor or faulty digestions, too much food that is hard to digest, and in the majority of instances it will be found that the liver is congested or inactive, from chronic constipation or lack of exercise (Vogel states it follows very frequently occurring in pregnancy), and carcinoma or stenosis in the posterior portion of the intestinal canal. In some cases it is due to a disturbance of the circulation, from disease of the heart or lungs, and from the irritation of habitual constipation.

Therapeutics.—The best treatment to pursue is cooling salves that reduce the irritation, and if the patient is constipated to use saline laxatives, but not in large enough doses to purge, such as sulphate of magnesia or sulphate of sodium, and cold enema and the application of an ointment of lead plaster. Any knots protruding from the anus may be removed by ligature, scarification, or by the scissors, and afterward touched by the thermocautery.

INTESTINAL PARASITES

(Helminthiasis)

Round Worms, Maw Worms (Ascaris Mystax)

Natural History.—The round worm of the dog, **ascaris mystax, ascaris marginata,** is white, yellowish-white or slightly reddish in color and twisted in spirals; there is a difference in the two sexes (see Fig. 40); the males are about 6 cm. and the female about 12 cm. in length. Their thickness varies from 1.5 to 2.5 mm. in both sexes. The head is slightly flattened and fitted with two wing-shaped borders, 2-4 mm. long, which start from the mouth and enlarge slightly as they pass posteriorly. The mouth is a round small opening, and fitted with three to six small lips, which cover a number of proportionately large teeth. The caudal end of the male parasite is curved and pointed and has numerous small papillæ on each side. The caudal end of the female is pointed and straight. The vulva is about the end of the first fourth of the body from the head. In the genital organs there can generally be seen quantities of round eggs (75-80 micra in size) that on examination are found to have a thick, hard shell, which is marked by numerous small grooves. These eggs are found in enormous quantities in the fæces of all dogs infested with the round worm (see Fig. 21). These nematodes have no intermediate host. The development of the embryo is not yet thoroughly understood, but from the experiments of Grassi, Penberthy, Albrecht, Fröhner, it has been demonstrated that the intestines of puppies that have never taken anything but the mother's milk, contain numerous ascarides, and they have demonstrated that an intermediate host is not necessary, but the worms can be developed directly from the eggs in another animal of the same species. The infestation results from swallowing eggs which are found in great quantities (masses) in the fæces if roundworms are present in the intestines; the eggs can remain viable for many months in a moist substratum, in garden soil, in floors of runways or dog kennels, wells, etc.

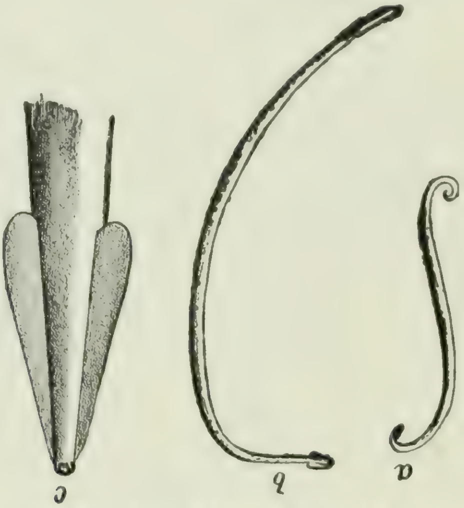


FIG. 53.—Ascaris mystax.

As a rule, the round worms cause little trouble in the dog, often producing no evident symptoms. Pemberthy found 250 in a six weeks old puppy that had constant vomiting, intestinal catarrh, emaciation, anaemia and decreased temperature. But in some instances, large masses of these worms collect and cause considerable catarrhal disturbance of the intestines, or they may even cause symptoms of intestinal stenosis. In rare instances, the parasites produce numerous hemorrhagic furrows or indentations in the mucous membrane. There is no doubt that in some cases round worms cause considerable nervous disturbance, such as cramps or epilepsy, and may even perforate the intestinal wall, causing a secondary peritonitis. The penetration of the parasite into the bile duct has been observed in young animals—puppies under six months. From the observations of Kitt, Gasteiger, Mingazzini, there is no doubt that these parasites cause harm, not only by absorbing nourishment that should go to the host, but by producing and excreting certain toxic substances that cause both inflammatory changes and nervous disturbances. These nervous symptoms generally disappear with the expulsion of the parasite.

Therapeutics.—The principal agent used to remove the round worm is zedoary seed, wormseed, floris cinæ and especially santonin, the alkaloid of the plant Artemisia santonica. Both can be administered and followed up by a dose of castor oil, or the oil may be given with them. The floris cinæ is given in doses of 2.0 to 10.0 and the santonin in doses of 0.05 to 0.2 for the adult dog and from 0.01 to 0.05 for young or smaller dogs. For the young puppy give the official pastilli santonini (santonin content 0.025), rubbed up in a little sugar, or in triturate, and in place of the castor oil use manna—or senna syrup. Decoctions of garlic, thymol (for several days after the morning meal; that is, only once a day, 0.3-1.0, best given in brandy; after the last dose give a laxative), areca nut (dose 2.0-15.0; laxative generally unnecessary), oleum chenopodii anthelminthici (3 times daily 0.25-0.5 in capsules or in emulsion; later 1-2 tablespoonfuls of ricinus oil), and the actual **tæniacides** are all administered by their various advocates. As a prophylactic measure, pregnant bitches that are about to whelp and are suspected of having ascarides should be put in another place, situated some distance from where they are to whelp and subsequently nurse their puppies and are then given medicine to expel the parasites. This should be followed by a laxative, to wash out the parasites and what eggs may be in the rectum; and after that the region of the anus should be washed to further remove eggs that may be in that region. Then the bitch is returned to the place where she is to whelp.

℞	Flor. cinæ pulv.	10.0
	Ol. ricini	50.0

Sig.—To be given on an empty stomach in one day.

℞	Santonin	0.3
	Chloroformum	5.0
	Ol. ricini	50.0
	Saccharum	0.01

Sig.—One-half in the morning and other in the afternoon.

℞	Santonin	0.2 to 0.3
	Ol. ricini	45.0 to 60.0

Shake the bottle before using.
Sig.—Divide into three portions and give one every four hrs.

℞	Ol. Chenopod. anthelminth	0.4
	Menthol	0.15

Misce et fiant capsul. gelat. tal. dos. No. vi.
Sig.—Given during 2 mornings (one capsule every 2 hrs.).

Tape-Worm.

Natural History.—The cestodes are flat tape-like worms without mouth or intestines. They grow from pear-shaped one-parent or head scolex and adhere together for a long time in a long ribbon-like colony. The scolex, so-called "head," is furnished with sucking cups and hooks, by which means it adheres to the mucous membranes of the intestines. The parasite is narrow at the neck, gradually widening. The single small flat worms (tape-worm segments) that bud at the lower end of the scolex increase in size as they are pushed farther back by the development of new members, and at its termination it consists of a number of matured segments that separate from the parent parasite, when they are fully developed, and are carried out among the fæces. Each segment is complete in itself, having both male and female genital organs. This order are hermaphrodites and are peculiar from the fact that they produce the germs of the new nursing mothers, of the shape of eggs, while the nurse remains sexless and seems to perform for the colony merely the duty of producing new "members" and to function as the anchor. The ripe segments (proglottides) are soon detached and pass either into manure, or escape independently or with the fæces into the open, into water, onto plants or grass. The proglottides, containing memberless eggs, break up and the eggs scatter in all directions. The eggs are then taken either directly with food into the stomach of a new suitable host or they are destroyed by decomposition and only those eggs that resist this are taken up by the new host. The eggs are covered with a hard, tough shell, inside of which is a six-hooked embryo. If the egg is taken into the stomach, the acid gastric juice dissolves the shell; the embryo is liberated, and immediately fastens the hooks into the mucous membrane of the intestine and from there penetrates the intestinal wall by means of its embryonic hooks, bores through the wall and escapes in an active or passive state to different organs, into the connective tissue of some of the adjacent organs, where it loses its hooks and forms a sac-like cyst. These cysts contain fluid, and are termed bladder worms, and produce from the wall of the cyst one or many (cœnurus) hollow buds, which represent the establishment of a like number of new tape-worms (tape-worm heads). In each of these bladders we find the individual tænia head furnished with hooks and the sucking cups. In some forms of the tænia these bladders divide and subdivide into numerous daughter-cysts or breeding buds, all of which produce the little heads of the tænia. This is frequently seen in the echinococcus, where enormous masses are found. If any animal, or proper secondary host, gets one of these ripe bladder worms into the stomach the gastric juice dissolves its covering and it finds its way to the duodenum, where it fastens itself by means of its hooks and sucking apparatus to the intestinal wall and instantly becomes a breeding parasite, developing by the addition of "segments" into a "tape-worm."

The anatomical structure of the cestodes is very simple. The body parenchyma is divided into two main layers, an external and an inner covering. In the latter, we find the sexual organs. The external layer is chiefly muscular, and contains also a mass of calcareous nodules that probably are meant to replace the defective bony structure of the cestodes. The surface of the head is covered with a chitinous-like, finely porous skin or cuticle, from which the hooks originate. A digestive system and blood vessels are absent, but in the inner layer we find a system of very much branched water vascular system, which, beginning at the head, passes through the entire body in the form of two or four anastomosing long canals, united at each joint by a cross system of similar canals, which is said to serve as an excretory apparatus. The branches running into these canals end at the last segment in a common orifice (porus excretorius). Each link or segment has an independent male and female sexual apparatus. The male apparatus consists of numerous pear-shaped testicular bladders with a canal of exit. The end can be turned up into the female opening. In the female portion we find ovaries, uterus and vagina. The uterus is remarkably well defined in each mature segment (see Fig. 54).

The injurious effect of the tape-worms depends partly upon the absorption of the nutritive substances, partly upon the mechanical disturbances (irritation of the mucous membrane, constriction or obstruction of the intestinal lumen) and perhaps also upon the excretion of specifically active poisons. Lesbre observed a "self-infection" in a dog infested with a Tænia serrata. In its brain were found Cysticercus pisiformis. No doubt that would have to be looked upon as an unusual occurrence.

The following varieties are seen in the dog:

Tænia Serrata (Fig. 55).—This variety is from 0.5 to 6 mm. in length and about 0.5 to 2 mm. and not over 6 mm. in width when fully developed. The head is large, proportionately, bullet-shaped, often almost four-sided, and is fitted with about 40 hooks in two rows and also the four sucking disks, which are oval in shape. The first sections after the head are very narrow, and the middle sections are almost square, often broader than long; the rear ones (matured) are oblong, barrel-shaped, 8-10 mm. long, 4-6 mm. broad. The anterior border of each segment projects slightly so that the edges of the chain seem serrated or saw-like, hence the name. The genital orifice is situated on the border, alternating one on the right and next on the left. The full-grown segments are nearly square or may be broader than long. The uterus has a long central body, with eight branches on the side. These send out numerous subdivisions from each individual branch. The eggs are indented on the sides and have a hard tough shell, 36 to 40 mm. long, 31 to 36 mm. wide.

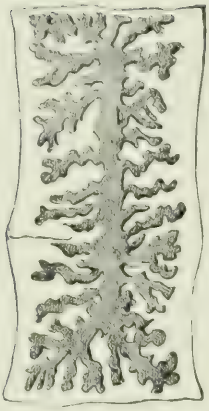


FIG. 54.—Uterus of the Tænia cœnurus (enlarged).

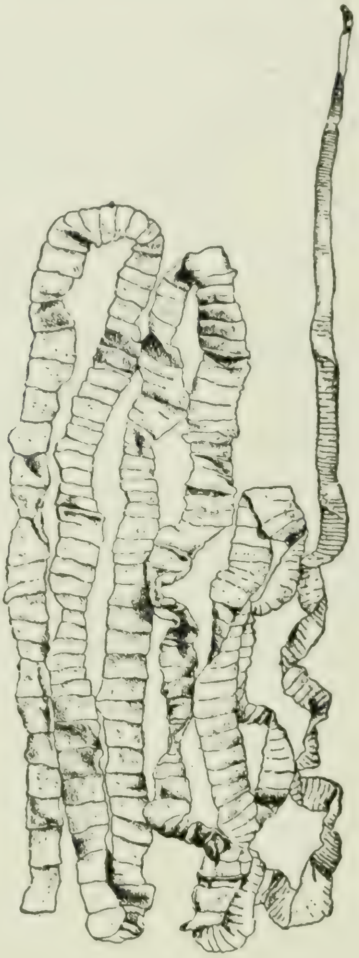


FIG. 55.—Tænia Serrata.

The larval stage of the oval shaped bladder worm, called the cysticercus pisiformis, is found in the liver, on the omentum and mesentery of the wild and domestic hare.

This grape-shaped cyst has been found to grow as large as a hazel nut, has been found by Lesbre in the brain of a dog affected by tænia serrata. This was probably caused by self-infection. This animal exhibited symptoms resembling rabies, and was incessantly grinding the teeth and snapping the jaws.

Tænia Marginata (Fig. 56.)—This is the longest and plumpest tænia of the dog, being from 1.5 to 3 m. in length. In rare instances it has been found to be 5 m. and the width of the developed segments is about 6 mm. Its head is nearly rounded with four small round sucking disks and a double crown of about 36 hooks. The segments in the middle of the colony are nearly square. They may even be broader than long, with irregular rear edges and partially overlap the following section. The sexual orifice which is situated on the margin may be alternately on the right or left side, the matured sections are longer than their width, being 14 to 16 mm. long and 5 to 7 mm. wide. The uterus has a short central body and has five branches on either side, to eight branches on each side, which are intertwined. The eggs, about 31 to 36μ (micra) in diameter, are almost entirely round and enveloped in a tough thick shell. The larva form of the bladder worm of the tænia marginata is the cysticercus tenuicollis, and is found in the serous tissues of the sheep, cow, goat, pig, squirrel, and monkey in captivity, and occasionally in man (Dewitz). Frequently we find the cysticercus on the peritoneum and liver of the sheep and pig, varying in size from a pea to the size of a man's fist.

Tænia Cucumerina (Dipylidium Caninum) (Fig. 57).—This is a small tænia 10 to 40 cm. long and not more than 3 mm. wide. It has a small elongated head, with sixty hooks with a retractable mouth or proboscis; the mature segments are rounded at the corners and are the shape of a gourd seed-like, hence the name, and have a small sexual orifice at each end. The individual sections are about 8 to 10 mm. long and barely 3 mm. wide. These segments are easily detachable, and are reddish-pink in color. This coloration is due to the color of the shell of the egg. The uterus is irregular, with double-shelled rounded eggs (if about 40μ (micra) in width) occur six to fifteen massed together in elongated cocoons. The non-sexual primary stage of this tænia, which is very common in the dog, is a cysticercoid found in the abdominal cavity of the dog-louse (trichodectes canis) (Metchnikoff) and also in the common dog-flea (certopsyllus canis) and in the flea of man (pulex irritans and pulex serraticeps).

Tænia Cœnurus (Figs. 54-58).—This tænia is generally about 40 cm. long, although in rare instances it may be 1 m. It has a small pear-shaped head, with twenty-four to thirty hooks and four small sucking disks. The anterior links of the colony are always very short, the middle ones square, and those at the extreme end are elongated and narrow, 7 to 13 mm. long and 3 to 3.5 wide, white and shaped like a cucumber seed. The uterus has a long central body, with eighteen to twenty-six simple side branches. The eggs have a hard shell, elliptical and 30 to 36μ diameter with an indurated border. The larval state of this tænia, which is the cœnurus cerebralis (bladder worm), is a rounded bladder which varies in size from a small seed to a large egg, and has a number of nursing or daughter-cysts on its inner wall. It is generally located in the brain, and in rare instances in the spinal cord. It is seen in all ruminants, especially sheep.

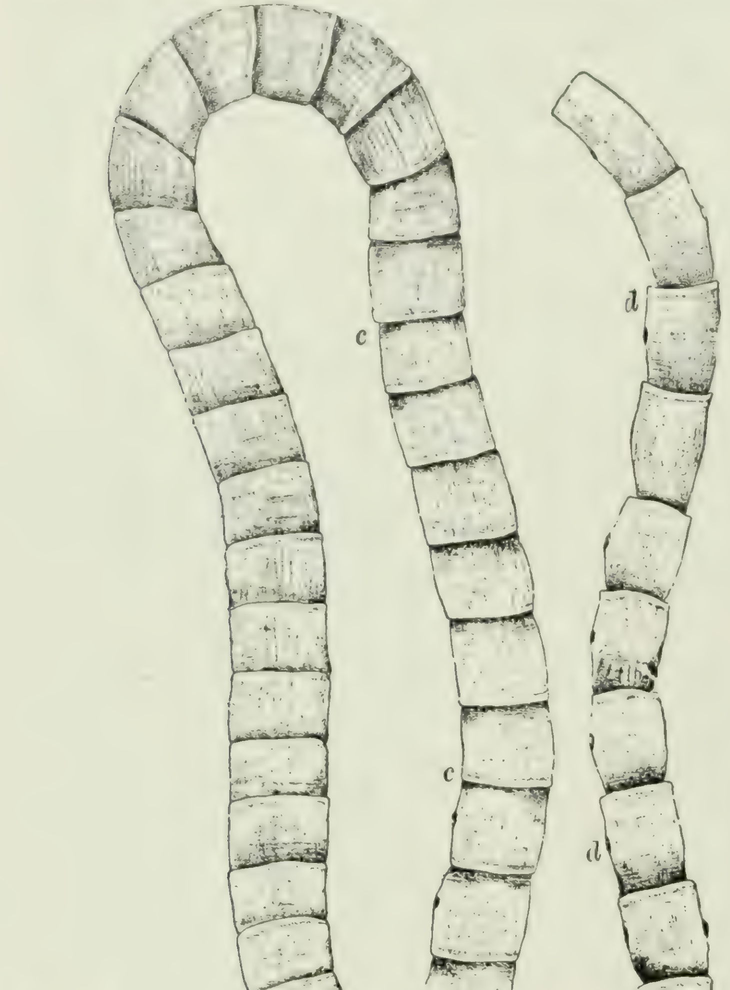


FIG. 56.—Tænia marginata, posterior end of worm.

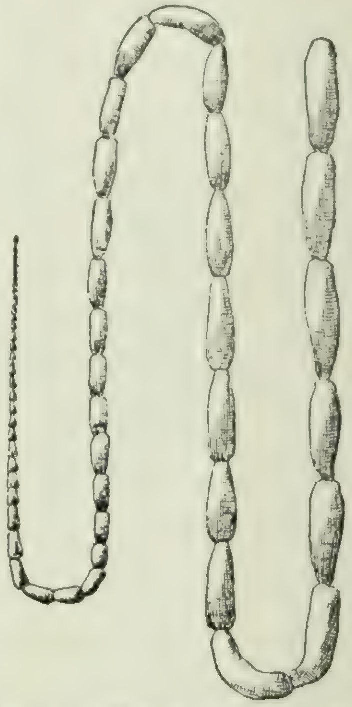


FIG. 57.—Tænia cucumerina, Dipylidium caninum.

Tænia Echinococcus (Fig. 59).—This is the smallest tænia of the dog, most dangerous to man. Its greatest length is 4.4 mm., and it has three and in rare instances four segments. The last segment is the largest and the only one to possess sexual organs. The uterus is large and irregular, branched, without any central border. The head is round and has four sucking bodies and twenty-four to forty-eight very small imperfectly developed hooks, arranged in two rows. The eggs are round

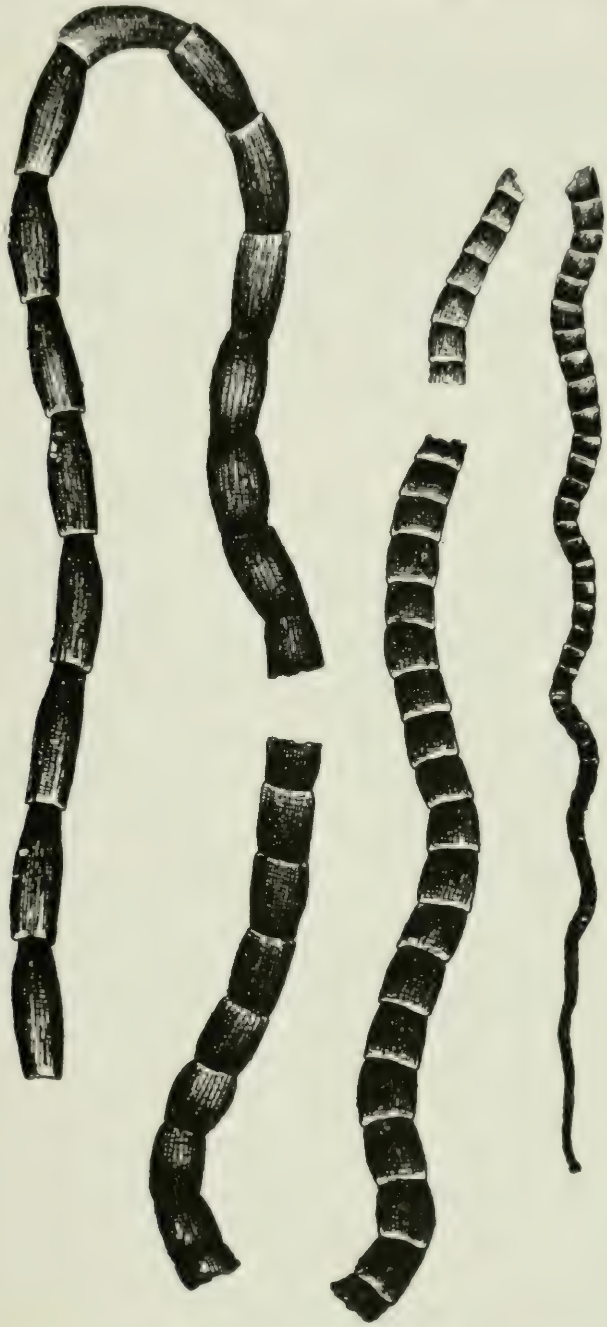


Fig. 58.—Tænia cœnurus.

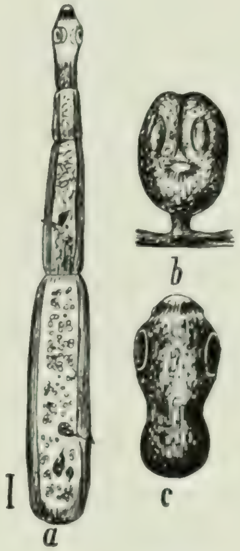


Fig. 59. — Tænia echinococcus: *a*, tapeworm, enlarged twelve times; *b*, cyst containing head; *c*, immature head.

and slightly elongated, the shell being formed in several layers. The bladder worm is the tape-worm resulting from the development of the two types of worm, the echinococcus polymorphus s. unilocularis and echinococcus alveolaris s. multiocularis. The bladder is filled with a nonalbumineus fluid and generally has daughter-cysts on the sides. These cysts may assume enormous proportions, ranging in size from a pea to a man's head or even larger and on the walls we find numerous ammen heads. These two varieties of the echinococci, the distinguishing characters being the length of the hooks and the arrangement of the eggs, are found in the pig, cattle and sheep and very rarely in solipeds and carnivora. Due to infection from a dog it may occur in man and (man being subject to infestation from a dog) in man it is generally found in or attached to the liver or peritoneum, but it has also been found in the lungs, kidneys, spleen, muscular system, pleura, bones and the brain.

The following parasites are occasionally found in the dog:

Tænia Serialis.—This parasite, about 35 to 75 cm. long, resembles the Tænia cœnurus, whose cysts or "measles" (Cysticercus s., Cœnurus serialis) were found in rabbits, hares and several other animals. The intermediate host of this parasite is found in the rabbit.

Tænia Litterata, pseudo-cucumerina, Tænia lineata (Mesocestoides lineatus).—This parasite resembles the Dipylidium caninum or Tænia cucumerina; is found very frequently in the fox, but rarely in the dog (Tænia Krabbei; Tænia balaniceps).

When animals (dogs) live on the sea-shore we frequently find them affected with bothriocephalus latus. This parasite is found in its immature state (tape-like plerocercoides) in certain fish which are eaten by the dog thus transferring the worms to the dog. This parasite has lately been found to occur frequently among dogs in Germany. It reaches a length of 2-7 m., has a lance-shaped head with two lateral, grooved suckers and matured segments (about 2 cm. wide, 4-5 mm. long) with the genital orifice in the middle and the uterus lily-shaped and centrally located. It is furthermore characteristic that the mature segments do not, as in tænia, pass out with the fæces. Therefore the examination of the fæces for eggs is of importance. These eggs are oval-shaped, about 70μ long and 45μ wide, and have a lid at the one pole which can be seen plainly when sulphuric acid is added (see Ill. 61).

Tape-worms are very common in dogs; some observers claim as high as 54% of all animals. Statistics show that in Berlin about 54% of all dogs were afflicted with tænia; in Zurich 34%, in Copenhagen 65%, in Budapest 14.8%. In Europe all varieties of the parasites seem to occur according to different speaking countries. The record given according to Schöne the following dogs in Leipzig were carriers of helminthæ (without exception): Hunting dogs, 52.94% of the cases were affected (mostly with Tænia serrata); butchers' dogs, 66.66% (mostly Tænia marginata); watch dogs confined to the yards and grounds around buildings, 40.44% (mostly Tænia cucumerina); work dogs used to pull, 72.22% (mostly Tænia marginata); sheep dogs, 57.14% were affected not only with Tænia cœnurus to the extent of 7.14%, but were also infested with Tænia marginata, Tænia serrata, Tænia cucumerina; pet dogs, 70.37%, of which 36% had Tænia marginata, Tænia cucumerina, and 15.74% Tænia serrata. The writer finds in the United States by far the most prevalent is the Tænia cucumerina, occurring in eighty-two of these cases, Tænia serrata ten, and marginata only in two instances, and Tænia echinococcus never observed. The author reports tænia echinococcus as a rare occurrence in his locality but as occurring frequently among dogs of Iceland. Thus Krabbe found only 0.6 of 100 dogs in Denmark (Copenhagen) affected with the tapeworm of three segments while in Iceland 28 out of 100 were afflicted.

There is no question that one individual is attacked to a greater extent than others, and the parasite finds more favorable conditions in the mucous membrane of the intestine of certain animals. The parasites may be found in enormous numbers, particularly the Echinococcus when they cover the mucous membrane and give it a velvety appearance (Fig. 62). Dipylidium Caninum is also found in great numbers, sometimes by the hundreds. One case found by Krabbe showed 2000; also tænia coenurus, while tænia serrata, especially tænia marginata is more apt to appear solitary although exceptions are always apt to occur. Zurn found 137 tænia in the intestines of one dog showing as origin 3 different species and weighing 375.0 gm.; Friedberger discovered by means of a tænifuge 178 specimens of tænia cucumerina and 24 of tænia coenurus in one fox terrier.

Clinical Symptoms.—When tape-worms are present they generally cause more or less disturbance in the host. Sometimes there are no other symptoms evident than the occasional passage of segments of the worm; on the other hand very decided symptoms, such as chronic intestinal catarrh, can sometimes be attributed directly to the presence of the parasites. Infected animals, as a rule, are restless, at times great eaters, and in spite of the amount of food they eat they remain thin. Often they produce the same symptoms as ascarides, but, as a rule, the tape-worm causes much more trouble than the round worms. Sliding hindquarters along on the ground, licking and gnawing at the anus point towards Tæniasis but may also appear as symptoms of other trouble. The accumulation of great quantities of these tapeworms may cause constipation or obstruction of the bowels and even produce death which may, however, be caused by haemorrhagic enteritis or—after perforation of the intestinal wall—by peritonitis. Schieferdecker found that in the duodenum, where the Tænia cucumerina are generally found, the mucous membrane had numerous small tunnels through which the tænia passed in and out, and caused a peculiar hypertrophy of the papillæ; in some cases they were four or five times their own length. In some cases Lieberkuhn's glands were sunken and collapsed and in several cases had completely disappeared. The Tænia echinococcus, when they are present in large

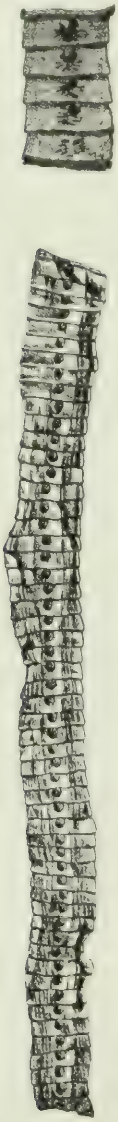


FIG. 60.—Bothriocephalus Latus. Above a few joints, natural size. Below, a piece of the worm somewhat reduced.

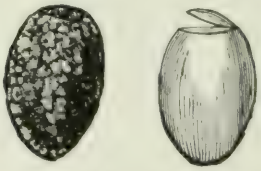


FIG. 61.—Eggs of Bothriocephalus latus, one after emptying contents of yolk.

numbers, cause great irritation of the intestines, with hemorrhagic infraction of the tissues. In nervous animals they cause epileptic spasms or even symptoms of rabies, such as a change of voice, paralysis of the lower jaw, dullness and indifference to surroundings; Friedberger and Frohner have also observed similar symptoms in dogs that have been affected with a Tænia cucumerina. In rare instances the tænia have been known to perforate the intestines. According to the observations of Cadeac, the perforation was made by two of the Tænia serrata. In a great number of instances it is impossible to say positively that the animal has tape-worm unless the segments are observed in the fæces, and the most dangerous to man (Tænia echinococcus) is extremely hard to find, on account of the small size of the segments. The other tape-worms are comparatively easy to find, as the segments are readily seen on the outside of the stools or catch in the anus and hang on the hair, the dog frequently drawing attention to them by licking the anus or drawing the hind extremity along the floor by means of the front legs. In doubtful cases it is well to give a small dose of some tæniafuge, and the animal will generally pass a few segments.

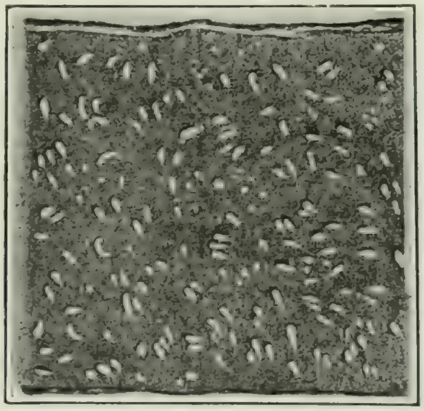


FIG. 62.—Tænia echinococcus; mucous membrane of a portion of the intestine covered with the parasites.

Therapeutics.—The most important of the numerous tæniafuges recommended are as follows:

1. **Extract of Male Fern (extractum filix mas).**—According to the experience of the author, it is the best agent to use. It is to be given on an empty stomach (in the morning being the best time). In small dogs in doses from 0.5 to 1.0 and in large animals 2.0 to 5.0, in pill form or in capsule. As this drug has no purgative properties, it must be followed up in one or two hours by a dose of castor oil (30 to 50 grammes). Many advise against the use of castor oil. Male fern is very liable to deteriorate

if kept any length of time. Therefore it is wise to procure it from a drug house that can guarantee it is fresh. This is also true of the filix capsules kept in stock. It must be borne in mind that male fern in large doses is a poison, and the maximum (4.0) must not be exceeded in a large dog. Gesimer advises filmaron in 0.2 to 1.0 capsules or a 10 per cent oil solution of filmaron. The dose of the oil should be 2-10 ccm. This should be given in the morning on an empty stomach and followed by a dose of castor oil.

2. **Kamala.**—This is to be given in doses of 2 to 8 gm., and in large animals up to 15.0. The powder may be rubbed in with a little ether and given in capsule but when the powder is bulky, as in large doses, it may be mixed with honey or syrup. It must be repeated in one hour after the first dose. As it is a purgative, it is not necessary to follow it up with any other drug, which is an advantage, but to completely empty the intestines of the parasite, it is sometimes wise to follow it with a laxative.

3. **Kusso (Flores koso).**—This is to be given in doses from 2.0 to 6.0 grammes, diluted with milk, or water, repeated three or four times at intervals of three-quarters to an hour. Only a good result can be expected when the drug is fresh. This should be mixed with, or followed by, a small quantity of castor oil.

4. **Areca Nut (semen arecae).**—The pulverized areca nut is administered in from 5.0—15.0 in capsule or as an electuary, mixed with honey or butter, followed by a laxative (castor oil) if no action has resulted within three hours. Sehiel advises a combination of areca nut and kamala. Areca nut is frequently vomited and must be given with raspberry syrup or some other sweet syrup, which generally prevents it being vomited.

The combination with kamala is very appropriate:

℞ Semen arecæ 20.0
Kamala 10.0
Ol. cacao q. s.
Fiant boli No. xxv.
Sig.—To be given 6-15, according to size.

5. **Chloroform.**—1.0 to 4.0 should be shaken up with castor oil (25.0-50.0) and given at once; the chief objection is, it is very apt to be vomited.

Pomegranate (Cortex granate).—In the shape of the macerated decoctions (5.0-45.0); other remedies are: 25 to 60 seeds (pumpkin seeds crushed and macerated in hot water). Oxide of copper in doses of 0.01 to 0.05 two to three times daily for several days. Turpentine 2.0 to 4.0 beaten up in the yolk of an egg, daily for three days. Benzine pelletierum tannicum, strontium lacuticum, creolin, naphthol are also tæniafuges, but are only used to a slight extent, as they are much less efficient than the first preparations mentioned.

It is important to precede the actual tapeworm treatment with a preparatory treatment. This consists in allowing the patient to fast the day before beginning the real treatment and if the dog is constipated to induce defecation by means of a mild laxative or enema. The tænifuge is administered early in the day on an empty stomach or even better still fifteen to thirty minutes after a small meal of mucilaginous soup or soaked rolls has been administered.

After the animal has passed the parasites they ought to be picked up on a shovel or other object and put in the fire to destroy the segments, especially if you have reason to suspect that the Tænia echinococcus is present, on account of the danger to man.

To check the development of tapeworms care should be exercised not to feed dogs parts of raw herbivorous animals or fish and to look after the prevention and extermination of fleas and mallophaga.

℞ Extract. Filicis 2.0
D. in capsul. gelatinos.
Sig.—Given in one dose.

℞ Kamal 8.0
Mellis depurat q. s.
M. et fiat electuar.
D. S.—To be given in two doses.

℞ Extract. Filicis 1.0-2.0
Kamala 4.0-6.0
Ol. Ricini
Sirup. Sennæ āā 30.0
M. D. S.—To be given in two doses; shake first.
(Laxative unnecessary.)

℞ Pulv. Sem. Avecæ 15.0
Olei Cacas et Ceræ flav. q. s.
Fiat massa, equa form. boli, No. xx. Obducantur keratino
D. S.—To be given in one dose (Fröhner).

℞ Cupr. oxydat 0.03
Sacchar. 0.05
M. d. t. dos. No. x.
Sig.—Give two powders daily.

℞ Ol. resin. felix mas. 0.75 to 1.0
Areca semina pulv. 1.0 to 2.0
F. M. capsule No. i.
Sig.—Give on an empty stomach, followed by castor oil.

℞ Ol. resin. felix mas.	1.0 to 4.0

F. M. capsule No. i.
Sig.—Give on an empty stomach.

℞ Kamala	1.0 to 2.0
Anæsthesin	0.15 to 0.2

F. M. capsule No. i.
Sig.—Give on an empty stomach.

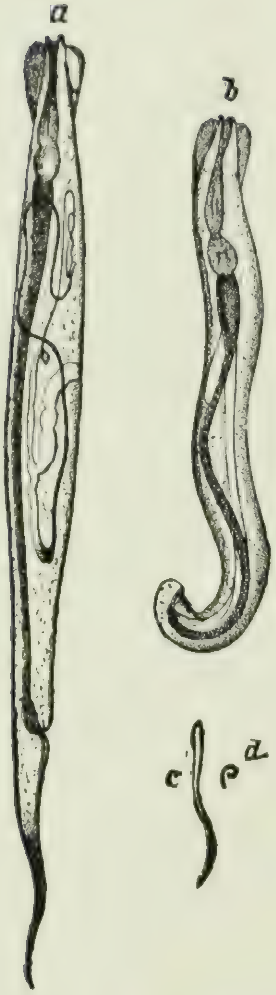


FIG. 63. — Oxyuris vermicularis: *a*, magnified diagram of the female; *b*, the male, magnified; *c*, natural size of the female; *d*, natural size of the male (*Vierordt*).

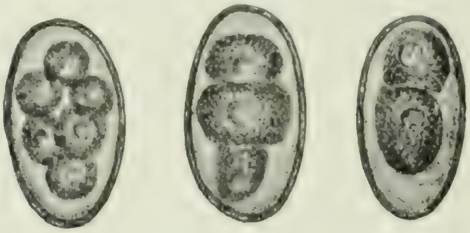


FIG. 64.—Eggs of Dochmius Trigonocephalus (*Railliet*).

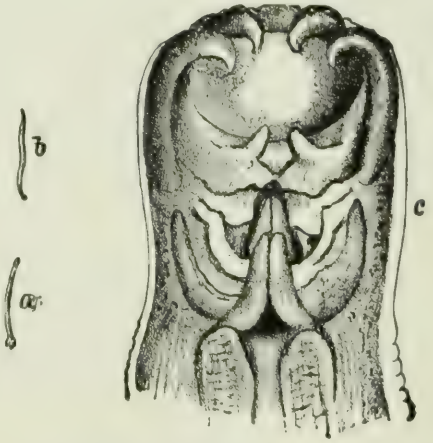


FIG. 65.—Uncinaria Canina; *a*, male; *b*, female (natural size); *c*, magnified head.

℞ Ol. res. felix mas.	0.75
Kamala	1.0
Ol. olivæ	drop 1

F. M. capsule No. i.

℞ Chloroform	2.0 to 4.0
Ol. ricini	30.0 to 40.0

Sig.—Give in two doses one week apart.

℞ Areca semina pulv. 1.0 to 3.0
Sig.—In capsule, honey or milk.

℞ Kousso 4.0 to 6.0
Mel
D. S.—Teaspoonful.
F. M. Electuray.
Sig.—To be given in two doses, one week apart.

Oxyuris Vermicularis (Seat Worm).—By this name (Fig. 63) we mean a small, white, thread-like round worm. The female is from 9 to 13 mm. in length. The male 3 to 4 mm. This parasite is rarely found in the dog. They are generally located in the rectum and the lower large intestines. They cause proctitis as well as great itching of the anus, and the animal is observed to lick that part constantly and also to frequently pull the hindquarters on the floor. The infestation takes place without an intermediate host through the eggs which are taken in per os. The embryo develops in the small intestine and the females come out of the anus to deposit their eggs.

These harmless parasites are removed by administering santonin and castor oil, as in the treatment for round worms; in addition use should also be made of clysters composed of solutions of salt water, quassia bark, vinegar or a weak solution (1-2000) of corrosive sublimate; of soap water, infusion of wormwood or garlic, or a solution of aluminum acetate.

UNCINARIA CANINA.

(Dochmius Trigonocephala. Anchylostomum Uncinaria. Hook Worm.)

The uncinaria canina is a small thread-like parasite (Fig. 65) which belongs to the family of strongylides (palisade worm). The end of its head is like a bell-shaped capsule, with a mouth provided with six hook-like teeth. By means of this sucking as well as biting apparatus of the bell-shaped disk and the teeth on the inner side of its mouth, it buries its head into the mucous membrane of the intestine (duodenum, jejunum, and coecum), and sucks blood, the head is so firmly attached to the mucous membrane that the parasite is found firmly attached to the membrane on post-mortem. These parasites usually collect gregariously by the hundreds. The caudal end of the male has a clearly defined pouch, whereas the female terminates in a sharp point. The male is 10 mm. long and the female from 12 to 15 mm. long. This parasite is found in Europe and is particularly common in the southern part of the United States, but it also causes the death of great numbers of puppies in the northern states, during the summer months. The parasites to be considered are

Dochmiases trigonocephalus (male 9-12, female 15-20 mm. in length) and stenocephalus (male 6-8, female 8-10 mm. long), perhaps also D. duodenalis. The eggs are oval shaped with an average length of 70μ (micra), generally show groove balls (Fig. 64).

The disease is indicated by general anæmia, the eggs which are passed in enormous numbers develop within a few days into larva in damp ground and continue living in water (pools, ditches, etc.) and are taken up in the drinking water from stagnant pools, in food, or from eating grass, particularly during a wet season, reach the intestines of the animal and the parasites soon mature. Dochmius is the cause of a severe disease (dochmiasis, uncinariasis) which occurs over a wide area, especially in United States, France, Italy, Japan and mostly among dogs living in packs (hunting dogs, kennel dogs) but in other countries, e. g., Germany, it has been observed rarely.

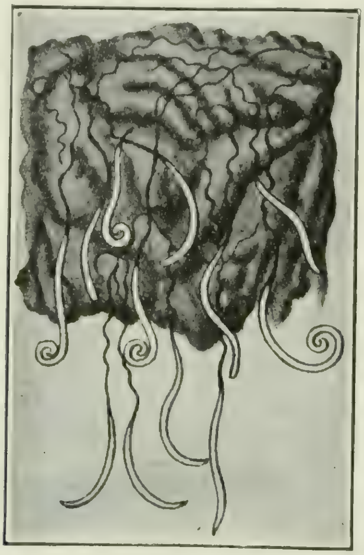


FIG. 66.—Wall of the cæcum with numerous Trichocephalus depressiusculus.

Puppies affected with uncinariasis become anæmic, weak and thin, have irregular appetites, epistaxis, oedema of the legs, and other pendant portions of the body, ulcerous or gangrenous processes in the skin, frequently are stiff and irregular in their gait after having lain down for some time, wobble and stagger from side to side; develop hemorrhagic enteritis and the passage of bloody fæces, with more or less tympanitis; in some cases there is persistent vomiting, this comes on in the latter stages. The number of red corpuscles in the blood is greatly decreased; furthermore poicilocytosis and leucocytocis arise. Just before death the membrana nictatans partially covers the eyes, the mucous membranes become whitish yellow in color, the animal has a very disagreeable odor, passages of green or bloody faeces, collapses and dies very quickly. On post-mortem there is very little change in the general abdominal organs, they are anæmic and a number of petechial spots are seen on the wall of the intestines and in the intestinal tract we find more or less bloody mucous, with the parasites lying free or attached to the walls of the intestine.

Therapeutics.—The treatment consists in the administration of thymol in puppies 0.25 to 0.75 doses, followed by teaspoonful doses of a saturated solution of Epsom or Glauber salts and in adult dogs from 1.0 to 1.50 of thymol can be given and repeated in three hours and a tablespoonful of the solution of salts administered four hours later. The treatment should be repeated in from ten days to two weeks. In particularly weak puppies it is well to lessen the dose and repeat it oftener. The volatile oil of chenopodium in capsule is also a valuable remedy in the destruction of uncinaria. It can be given in combination with olive oil or in emulsion. The latter, however, makes a rather bulky dose. It should be given in puppies from 0.10 to 0.25 doses and in adults from 0.50 to 0.75 followed two hours later by a teaspoonful dose, in a puppy, and a tablespoonful dose of castor oil in an adult dog. Recently the use of Carbon Tetrachloride has almost entirely taken the place of all other drugs in the treatment of this parasite. The drug is generally administered in the flexible capsule not only on account of its irritating nature but also if inhaled in quantity causes pronounced dyspnœa and death in some cases, although this is rare, and while they may remain in a semi-comatose condition for several minutes they generally recover. The dose varies from 0.1 to 0.3 and should be administered on an empty stomach, and repeated in a few days. Some give a full capsule of Castor oil and half an hour after give the Carbon Tetrachloride capsule and then in three more hours another capsule of Castor oil and the capsule of Carbon Tetrachloride as before, but while this seems to remove almost all the parasites at one treatment (some claim a hundred per cent) still it has been found to be rather drastic and may kill puppies or young dogs that are inclined to be weaklings. The better plan has been found to repeat in a week and then if found necessary in the week following. Other tæniafuges that may be administered are extractum filicis, Kamala and arsenic. Megnin recommends a mixture of 4.0 Kamala, 0.5 calomel, and 0.01 acidum arsenicosum. Abundant but easily digested food should be supplied and the anæmia combated by the use of iron. Especial attention should be paid to the prophylaxis—separating the well and sick dogs, destroying the faeces, disinfecting the kennels, runs, food and drinking basins, and giving of pure water which is best previously boiled.

Trichocephalus Depressiusculus. Whip Worm.

This parasite is occasionally seen in United States and also in Europe. It has a short body terminating in the posterior part into a white thread-like filament which is twisted and turned on itself. This parasite is found in the cæcum firmly attached to the mucous membrane sucking the blood of its host. It produces a general anæmia and great emaciation and catarrh of the intestines and on post a hemorrhagic condition of the intestines and great thickening and even invagination of the cæcum.

The treatment is the same as that used for the uncinaria.

Besides the already mentioned parasites we also find Hemistomum and alatum and cordatum, Echinostomum perfoliatum and trigonocephalum, Distomum heterophytes, Echinorrhynchus canis and the Laniblia intestinalis belonging to the flagellates. The Distoma echinatum (Generali and Ratz) and the Distoma heterophytes, found by Jansen in Japan and by Loofs in Egypt, in the intestines. The Trichocephalus depressiusculus is found in the cæcum (Fig. 66). This parasite, according to a number of authors, may produce a catarrh or hemorrhagic condition of the intestines (typhlitis catarrhalis or haemorrhagica) and invagination of the cæcum, which, as it seems, occurs especially among dogs suffering from dochmiasis. Animals affected with these parasites suffer from dochmiasis or anæmia. The distomum heterophytes was found in an animal presenting symptoms of rabies.

DISEASES OF THE PERITONEUM

Inflammation of the Peritoneum—Peritonitis.

Etiology.—Peritonitis is comparatively rare in dogs and is generally seen as a secondary disease; due originally to some irritation or injury of some of the other organs of the abdomen, the stomach, intestines, spleen, liver, kidneys, bladder, prostate, or the uterus. From toxic gastro-enteritis, ulceration of the stomach or intestines, accumulations of fæcal matter in the intestines; from metritis or parametritis after labor; from inflammation or abscess of the liver; from purulent inflammation of the kidneys, or from purulent pleuritis; from rupture of the abdominal viscera and the escape of food, fæces, gas, bile, pus, parasites perforating the intestinal mucous membrane, and in rare instances from the presence of parasites (Plerocerooides barletti) or certain phycobacteriacae (see Streptothrichosis) in the abdominal cavity. It may also occur from a general inflammation of all the serous membranes of the body, as is sometimes observed in infectious diseases; to pyæmia or metastatic peritonitis; from the breaking down of tubercular masses that have collected on the peritoneum, or from cancer. Primary peritonitis is always caused by some injury to the abdominal wall, shocks, blows, or by penetration of the abdominal walls, principally accidental or after some operations and from cold (rheumatic peritonitis).

Pathological Anatomy.—According to the extent of the disease we call it either partial (circumscribed) or general peritonitis (diffused); according to its course, acute or chronic; and according to its character,

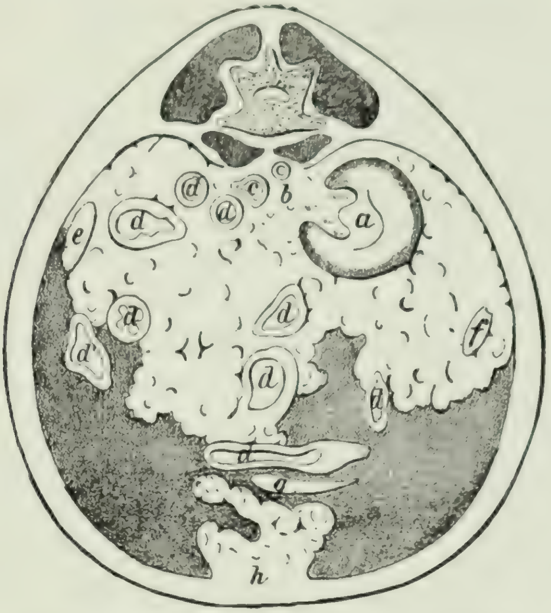


FIG. 67.—Section through the abdomen of the dog showing the distribution of the peritoneum: *a*, kidney; *b*, aorta; *c*, vena cava; *d*, intestine; *d'*, duodenum; *e*, pancreatic gland; *f*, spleen; *g*, liver; *h*, subperitoneal fat.

we call the exudate serous, fibrinous, purulent, putrid, or hemorrhagic, peritonitis. The purulent form of the disease is the most common and on account of the extensive irritation that any inflammation causes in the peritoneum, it is apt to take the diffuse form of the disease; and while it may start originally as circumscribed, the disease generally becomes diffuse in a short time. In acute, diffuse peritonitis the peritoneum is first injected and ecchymosed, becoming dull red and velvety, due to the removal of the endothelium and partially to the exudate, which contains more or less fibrinous substances. This collects as a thick layer over the peritoneum and the exudate often unites the intestines to each other or to the different organs in the abdominal cavity, or even to the sides of the abdominal wall. In recent cases these adhesions are easily pulled apart, but later on they become firmly united and are very hard to separate (adhesive peritonitis). There is also a quantity of fibrinous exudate thrown out, which is accompanied by more or less liquid, which as a rule is purulent, or ichorous, all of which is found free in the abdominal cavity. This varies from a small quantity to several litres. There is always some œdema of the serous wall of the intestines, which becomes soft and friable, often filling the intestinal canal with gas (Fig. 67).

The chronic form may start out as such at the onset, but generally it follows an acute attack, the peritoneum becomes very much thickened and adhesions form, with the intestines and the adjacent organs grown together in many places, at times contracting of the intestinal walls, due to the contraction of the newly formed connective tissue, the intestinal walls and causing a lessening of the diameter of the intestinal canal, kinking it or displacing the intestine. In the chronic form the exudate is not purulent, as a rule, the fluid exudate which often fails to appear in any great quantity, has a cloudy serous appearance, may be thinly purulent and occasionally appears more or less hemorrhagic, but is composed of a thick, hemorrhagic serum. In the dog, we sometimes observe a form of ascites (see under that head) in which we have a chronic inflammation and thickening of the peritoneum and a collection of a turbid, fibrinous exudate (inflammatory ascites).

Circumscribed Peritonitis may be caused by any irritation of the viscera, such as inflammatory and suppurative processes of the stomach, intestines or uterus, classed as perigastritis, perienteritis and perimetritis and the irritation extends to the serous coat. When operating (laparotomy) we often find small circumscribed deposits on the liver, occasionally on the spleen and other abdominal organs, that have originated from slight peritonitis. In cases where there is a small amount of purulent peritonitis, the inflammation remains in one locality and becomes encysted. As a rule, with the exception of circumscribed peritonitis, death generally occurs in the first stages of the disease, usually after 2 to 7 days, and it is only in the mild cases, where the exudation is very slight, and the condition changes to a chronic form that there is any chance of recovery. The euxdate breaks down and is re-absorbed but, as a rule, there is such an extensive alteration and adhesion formed that it is only in rare cases that the animal ever is restored to perfect health.

Clinical Symptoms and Course of the Disease.—(1) Acute diffuse peritonitis. When the disease is caused by some traumatism, by perforation, either from the intestines or externally, the violent symptoms appear rapidly. In a secondary disease these symptoms may readily be modified by the existing main ailment, may sometimes even be entirely obliterated. At first there is colic, great restlessness, and a stiff, unnatural gait. The posterior extremities are carried out from the body and are not flexed. The animal groans and cries and looks or snaps at the abdomen. Often there seem to be short periods of improvement followed, however, by severe attacks of pain. The pain is continual, the abdomen, which is usually hard and distended, is very sensitive on manipulation, the slightest touch produces intense pain. There are some cases in this disease, however, where the animal shows very little pain, but this is only seen where there is great debility. In such a case it is possible that the peritonitis may sometimes be entirely overlooked. The abdomen becomes distended in the early stages of the disease, due to inflation of the intestinal tract from gas and later on by the collection of the exudate. When the abdomen is distended, if gas is present, on percussion, the sound is hollow, and when exudate is present, the sound is dull. The exudate, of peritonitis, similar to the transsudate in ascites, of course, lies on the floor of the abdominal cavity; but where the exudate forms very rapidly, the whole abdomen is filled up, pressing on the diaphragm, compressing the lungs and causing great dyspnœa. Nevertheless it usually follows changed positions of the body less quickly and less completely (see later ascites). In cases of doubt a conclusion can be drawn by making an exploratory puncture. Due to the painfulness of the abdominal peritoneum, meteorism and the exudate the breathing is lessened and made more difficult. The type of breathing is almost always entirely costal. The visible mucous membranes are more or less cyanotic.

In the early stages the abdomen is tucked up, the walls tense, firm and painful to the touch, and it is generally some time before the abdomen begins to enlarge from the collection of the exudate. As a rule, the bowels are constipated except where there has been some diarrhœa, or diarrhœa alternated with constipation, present before the disease started, which is seen in those cases where there is ulceration and perforation of the mucous membranes. Occasionally the dog vainly attempts with more or less audible utterances of pain to defecate. Vomiting is almost always present, the vomited matter being greenish-yellow mucous, since dogs afflicted with peritonitis usually have no appetite at all, and in the latter stages we frequently find fæcal matter in the vomited material; the urine is lessened in amount, often voided with utterances of pain and contains a large amount of indican. There is total loss of appetite. The temperature rises to 40° C. or above. If the disease is not so severe as to cause death in a day or two the temperature fluctuates, being high at one part of the day and then it becomes subnormal, its character being remittent, or the temperature may last for some time, especially in the septic form, or become subnormal towards the exitus letalis. The pulse is fast, thin and wiry, and finally imperceptible.

The majority of cases are fatal, the animals dying in from one day to a week, according to the intensity of the disease. They usually die in a condition of collapse; in rare cases from heart-failure or suffocation from the rapid collection of the exudate. The most rapidly fatal cases are those due to the perforation with septic infection.

Circumscribed and Chronic Peritonitis.—Circumscribed peritonitis produces less marked symptoms and is harder to recognize than diffuse chronic peritonitis being those of ascites, and, as a rule, not diagnosed except on post-mortem. On the other hand chronic diffuse peritonitis has as its main symptoms those of abdominal dropsy, and is usually only recognized by making an abdominal puncture and seeing the fluid flow out; this is generally designated as peritonitis chronica. The best way to confirm a diagnosis is to puncture the abdomen with a small trocar and see the character of the fluid.

Therapeutics.—Remove the cause if possible; if this cannot be accomplished by surgical interference, acute diffuse peritonitis should be treated, even though with little prospect of success, with constant applications of cold water compresses to the abdomen, and, if the irritation is camphor oil, mustard poultices or diluted mustard oil; the latter is the best. Take 30 to 50 grammes, of a mixture composed of mustard oil, 10 very intense, the application of a counter-irritant such as frictions of parts, and olive oil 100, rubbing it well into the abdomen; applications of hot water to the abdomen by means of the Priessnitz compress are also useful. Use may also be made of hot mash compresses (fango or flaxseed), less often of tincture of iodine or mercury salve (1.0 prodie) or ice compress. The Priessnitz compresses usually are not strong enough. They can be increased in efficacy by substituting alcoholic spirits for the water or by rubbing in mustard spirits every time the compress is changed. Opium is to be given internally in doses of 0.1 to 0.5 grammes; or tincture of opium laudanum 1.0 to 5.0, and where there is collapse give whiskey and spirits of camphor. If there is any obstruction of the bowels, give injections of warm water or oil subcutaneous or intravenous injections of physiological salt solution, with a small quantity of suprarenin. It is advisable not to use laxatives at all. In case of very severe pain morphine (subcutaneous) is preferable to opium. Anything further can be found in the chapter on "septicaemia." The exudate should be removed by puncture of the abdomen, but this is not to be done until the acute symptoms have subsided. According to Jakob the puncturing should be followed by an injection of 50.0 of Lugol solution (made of 0.5

iodine, 2.0 potassium iodide, 100.0 water) and 100.0 liquid paraffinum. It must always be borne in mind (and this holds good in inflammation of other serous membranes) that the production of a serous exudate is a process that tends to lessen the acuteness of the existing conditions, because the liquid helps to keep the intensely inflamed parts separate and prevents frictions and its complicating inflammation, hence it should not be removed too early but when the exudate is suspected to be purulent and by means of an explorative puncture has been proven to be so, a laparotomy must be performed, and the whole abdominal cavity washed out with a weak solution of salicylic or boric acid. When the animal shows signs of recovery, the diet must be carefully regulated. During the first few days no food at all should be given, then at first milk, or thin soup, as the animal is very apt to vomit. Then the lightest diet, soup, milk, juice of beef, a small quantity of lemon or raspberry juice in water, or pure water, can be administered, a teaspoonful at a time, or a teaspoonful of essence of pepsin, to allay the severe thirst which often occurs.

The treatment of chronic exudative peritonitis is in general like that of ascites (see later) ; but in addition the chronic exudation peritonitis also may often require a local, reabsorbing treatment (Priesznitz compresses about the abdomen, systematic rubbing of the abdomen with soft soap or gray mercury salve) as well as internally potassium iodide. After puncturing wash out the abdominal cavity with a weak solution of Lugol solution (1 iodine, 5 potassium iodide, 500 aqua dist.) or with other antiseptic fluids (see ascites).

Abdominal Dropsy.

(Hydrops Ascites; Ascites; Hydrops Abdominis; Hydrops Peritonei.)

By this is meant a collection of serous liquid (transudate) in the abdominal cavity that originates without inflammatory symptoms, being due to transudation. The amount of liquid collected varies very much. In some cases there are only a few spoonfuls that are found accidentally during an operation, in others 15 to 20 litres of liquid.

The color of the liquid is sometimes as clear as water, but generally it is reddish or yellow. It may also be filled with flakes of fibrin, which indicate chronic peritonitis, or turbid as milk (chylous ascites). When exposed to the atmosphere it usually remains fluid and only in rare instances it becomes firm and jelly-like. (This latter condition was observed once by the author.) It is thin and watery and slightly sticky when pressed between the fingers and about the specific gravity of blood serum. Its specific gravity and albumin content are lower than in the exsudat of chronic peritonitis.

Fröhner and Zwick found the albumin content of the ascitic fluid equal to 3.5%; in 36 cases of ascites (in the dog) Hofmeister found on the average a specific gravity of abdominal cavity fluid of 1016 and an albumin content of 2.7 (0.5 to 4.55) %. In the case cited by the author (see above), in which the ascitic fluid became jelly-like when exposed to the air, the albumin content was 3% and the specific gravity 1017. In one case of chronic peritonitis the specific gravity of the fluid was determined at 1020 and the albumin content at 4.3%.

At first the peritoneum is normal, but, if this condition lasts some time, the peritoneum becomes macerated, is pale, slightly thickened, then through fatty degeneration of the endothelium becomes dull white, and finally a general degeneration sets in. When the animal has been repeatedly punctured, inflammatory processes may take place, and are followed by heavier thickening or partial adhesions. The abdominal organs become anæmic and frequently dropsical (Fig. 68), as a result of the prolonged pressure caused by the ascitic fluid; the intestine is often contracted. When operating the changes may be found that produced the ascites.

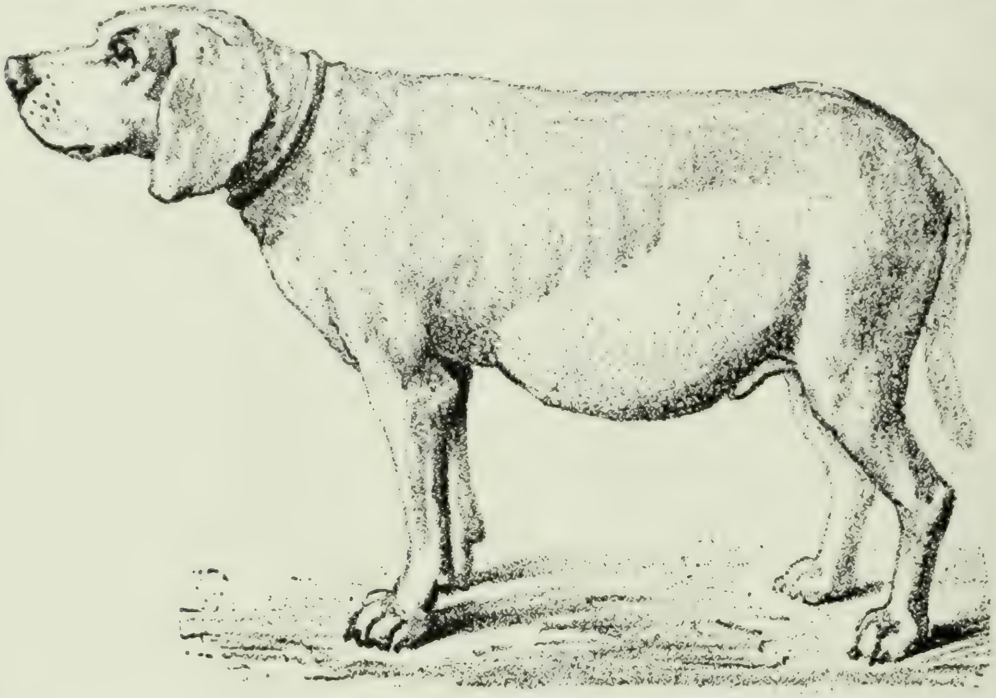


FIG. 68.—Dog with ascites.

Etiology.—Ascites very rarely appear as an independent disease, but must in most cases be regarded as a symptom of another disease. As the peritoneal veins belong to the mesenteric system, any obstruction of the portal veins cause these serous collections, for instance, in cirrhosis of the liver, or tumors of that organ, or from compression of the mesenteric veins by tumors, abscesses, etc. Ascites is also seen as a symptom of general dropsy of the kidneys or chronic disease of the lungs, chronic disturbances of alimentation, marantic conditions, and from defective action of the heart. It may also be caused by local diseases of the peritoneum, such as tuberculosis, carcinoma, or from chronic inflammation between transudate and inflammatory exudates. A sharp line of demarcation can hardly be drawn, in such cases, between transudate and inflammatory exudate. In young animals ascites may develop without any other complications or cause and the effusion may often disappear of its own accord or after puncture and aspirating the fluid it never returns again. (Hutyra and Marek).

Clinical Symptoms.—The chief clinical symptom of this disease is the accumulation of fluid in the abdominal cavity. Small amounts very frequently are not noticed and in fact, cannot be determined by any means except by tapping. When there is a considerable collection of serous fluid, the abdominal wall is distended, and, from being in the lower portion of the abdomen, the cross-section outlines of the trunk resemble those of a pear. There is a peculiar sunken appearance of the flanks (see Fig. 68). When the tips of the fingers are struck against the distended abdomen, there is a fluctuating movement (pear shaped hanging abdomen). If the animal sits down or if the forepart of the animal is raised, then the bulging moves backward and downward and the abdominal walls sink in behind the ribs; and when there is a large quantity of fluid present, the splashing sound of the fluid can sometimes be heard when the patient is standing and if one hand is placed flat on one side of the abdomen and the other side of the abdomen is struck sharply with the flat of the other hand. By percussion, we can tell, to a certain extent, the amount of the fluid present. The animal should be made to stand, so that all the fluid lies in the base of the abdomen. By percussing, beginning at the lower part of the abdomen and moving upward on the wall where there is fluid present, we will get a dull sound; and when the line of fluid is passed, we get the intestinal or tympanic sound. It is very important that the animal should be in a standing position, as it can be readily understood that when the animal is lying on its side, the fluid gravitating to the lower side, we would get a clear tympanic sound all over the abdominal wall on the upper side and still have a large quantity of fluid in the cavity. Only in very severe cases of ascites when the abdomen is distended into a cask shape is it possible that the percussion sound is dull everywhere.

The higher the fluid collects, the greater is the pressure on the abdominal organs, and the consequent pressure on the diaphragm, causing interference with normal respiration. The interference may be relieved if the forepart of the patient is held high whereas it is increased if the rear part is held high. These symptoms are due to the pressure the fluid exerts on the diaphragm which also accounts for the fact that dogs suffering from ascites prefer a sitting posture. The pulse is generally slow and faint, the heart beat beating, the rectal temperature not increased. The urine is generally normal, but reduced in quantity, and the quantity of the accumulated fluid pressing on the bladder may sometimes cause involuntary emptying of the bladder. Other symptoms are: bodily weakness in spite of the fact that the appetite is usually good or very little impaired. In the later stages œdematous swellings appear in the extremities, or we may find a general dropsy, the digestion is impaired, and the bowels disturbed. In the majority of cases constipation which often alternates with diarrhea is present, with occasionally vomiting. In addition to these symptoms there are also those of the primary disease. While it seems very easy to make a diagnosis when the above symptoms are present, still the following diseases may present several or all of the symptoms above described.

1. **Acute or Chronic Peritonitis.**—When one reads the symptoms of acute peritonitis the diseases can be readily separated, but in the latter part of the disease, when the effusion has collected, or where the chronic stage of peritonitis is present, it is a little difficult to separate them, the only positive means being to puncture the walls with a small trocar (hypodermatic) and obtain a small quantity of the fluid, and it is rather common to see ascites associated with chronic peritonitis. After all it would be of no vital importance if the two diseases were confused since the treatment of abdominal dropsy is fundamentally the same as that for chronic peritonitis.

2. **Fatty Deposits in the Abdomen.**—This disease is quite frequently present in old dogs; but a differential diagnosis can be made from the fact, that, where there are enormous collections of fat present, the abdomen is round in appearance, but does not become pendulous, whether the dog is standing or recumbent. The extended absolute areas of dull sound are also lacking. It is well not to puncture in these cases, as it gives no information, and may cause internal hemorrhage. But in cases of doubt it is necessary to resort to exploratory puncturing.

3. **Abdominal Collections of Urine in the Bladder.**—In these cases we feel a fluctuating ball-shaped body in the posterior portion of the abdomen; this swelling does not follow the changes in the position of the body, as is indicated by percussion. A good way to make a differential diagnosis is to lift up the animal by the posterior extremities, and

if it is ascites the liquid will settle on the diaphragm and interfere with respiration; if the bladder is filled, we do not have the dull percussion sound. There also exists difficulty in voiding the urine.

To further confirm the diagnosis pass the catheter.

4. **Distention of the Bowels with Gas (Meteorismus).**—In this instance, there is an absence of the fluctuation and the clear tympanic sound all over the abdomen.

5. **Collections of Urine in the Abdomen after Rupture of the Bladder.**—On the passage of the trocar, the clear urine is passed which can easily be recognized by the color and odor, with absence of urine on catheterization, and uræmic fever, or convulsions.

6. **In Advanced Gestation.**—By careful manipulation the fœtuses can be easily distinguished in the abdomen. Earlier stages of gestation could never be confused with ascites.

Besides the above conditions, we may also have to distinguish between ascites and tumors of the abdominal cavity (hydrometra, pyometra). All these affections can be recognized by carefully considering the history of the case and the accompanying symptoms by palpation from the outside or from the rectum or vagina and partly by the exploratory puncture.

It is always well to carefully study the exciting cause of the disease (ascites), as the course of treatment depends on it. This, however, is rather hard to do, but, as a rule, the collection of fluid is caused by the damming or interference in the mesenteric system, of which the most common is cirrhosis of the liver, or some interference in the portal system. These are likely to improve with tapping and symptomatic treatment. On the other hand ascites, which appears with other hydropic symptoms and which is more apt to appear as a partial symptom in conjunction with a general dropsy, is caused by diseases of the heart, lungs, kidneys, etc., or by hydræmia or marasmus. Naturally exceptions frequently occur. By making a thorough examination of the organs that might come under consideration, it is often possible to determine the fundamental exciting cause. But in anasarca, hydrothorax, general dropsy due to a weak heart, or valvular affections of that organ, disorders of the lungs or kidneys, hydræmia or marasmus; it depends to a large extent on whether we can either restore the affected organ to a normal condition, for if they are permanently affected, the condition is generally chronic. Quite often we find affections of the liver and spleen that are never recognized during life. To make an examination of these organs it is well to do it just after the animal has been tapped and the fluid has been removed; the walls of the abdomen are collapsed, and the organs can be manipulated with greater ease at that time. If tumors are present, they are readily recognized.

Notwithstanding all the etiological conditions described, there are often cases where the cause can only be guessed at.

Prognosis and Therapeutics.—As a rule, the prognosis is unfavorable as we are generally unable to remove the exciting cause. The cases that recover are generally in young dogs and the dropsy is the only existing condition. In the majority of cases, the ascites disappears spontaneously. Our first effort is to remove the exciting cause, if it is recognized; and then to remove the dropsical effusion, either medicinally or surgically. At the same time the animal should be well fed on highly nitrogenous, easily digested food and tonics (see anæmia), and the application of firmly wrapped Priesznitz poultices which may at least be efficacious at the beginning stages of the disease. The following medical or surgical treatments are especially to be carried out:

1. **By Laxatives.**—This method which in general are to be recommended but little, is to be followed where there is constipation associated with the disease and then only temporarily. Saline purgatives are the best (glauber salts. epsom or rochelle salts), perhaps also calomel, but such laxatives as jalap, podophyllum, castor oil, are contraindicated, as they irritate the stomach and destroy the appetite and weaken the animal. The salines are indicated, only in sufficient doses, to cause a slight laxative action, so as not to interfere with the appetite.

2. **Diuretics.**—This form of treatment has always been popular to be given and is still much used, especially for ascites. These are only used where there is positive evidence that there is no previous irritation of the kidneys. The best are the vegetable diuretics, such as digitalis, strophanthus, tinctura strophanthi (0.5-1.0), caffeine, salicylate of soda, oil of juniper, liq. potassii acetas; among the more recent diuretics are theocin, theobromin, soda salicylate 4.0 to 6.0 in sol., diuretin 4.0 to 6.0; the best saline drugs are acetate of potassium and sodium.

℞	Agurin	0.1 to .04
	Caffeine-sodium-salicylas	2.0 to 5.0
	Saccharum alba	5.0

M. f. et divide chartulæ No. x.
Sig.—One powder three times daily.

℞	Agurin	2 to 6.0
	Aquæ menth. pip.	150.0

Sig.—Tablespoonful three times daily.

℞	Tinc. digitalis fol.	1.0
	Liq. potassium acetate	30.0

Sig.—One teaspoonful three times daily.

3. **Hydrochlorate of Pilocarpine.**—We may sometimes obtain very good results with this drug. The injection of the solution subcutane-

ously is made once or twice daily (0.005 to 0.01 of water). A decrease in the transsudate is often very noticeable if at the same time all liquids are withdrawn (dry diet); however pilocarpin is contraindicated in diseases of the heart and lungs. Zahn gave three drops of the 1 per cent solution on the tongue, three times daily. The administration of this drug causes the amount of saliva to be greatly increased, and the amount of fluid exudates to be very much decreased. Frohner recommends Arecolin.

4. **Tapping or Puncture of the Abdomen.**—This is indicated where there is a large collection of fluid, that is pressing on the diaphragm, and also used as a diagnostic procedure. Whether it is best to remove the fluid in all cases is a question that has not yet been decided; yet the writer is of the opinion that the fluid should be removed, provided the animal is robust and not too old, especially as the operation, if carefully performed, is comparatively harmless, and has the advantage over purgatives and diuretics in that the accumulation is removed quickly. In a great number of cases, especially with younger animals, the fluid has not accumulated after one or more punctures. One disadvantage connected with this operation is the great loss of albumen by the body; also in a few instances with older dogs death resulted because of the excitement and resistance displayed by the dog. Friedberger and Frohner have seen old dogs that have died during, or shortly

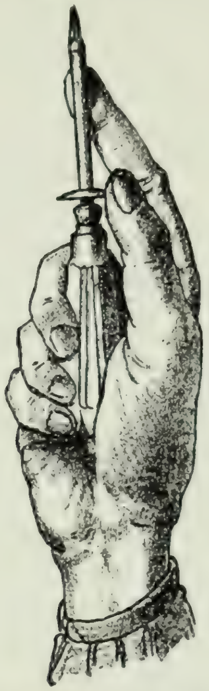


FIG. 69.—Method of holding trocar for puncturing.

after, the operation. The method of puncturing or tapping is to take the ordinary trocar, a narrow caliber one is best, even if it takes a long time to drain out. We thus avoid unconsciousness, even paralysis of the brain, which sometimes occurs where a large quantity is drained out too suddenly, and an occasional interruption of the flow of the liquid usually becomes unnecessary. During the operation the pulse, respiration, and general appearance and conduct of the animal must be watched carefully, in case the animal might collapse from the shock. In such an event, the trocar must be removed instantly and a restorative, as a subcutaneous injection of spirits of camphor must be given. The trocar should always be boiled, immediately before using, and the field of operation and trocar be thoroughly disinfected.

The method of operating is very simple. The trocar should be gripped firmly in the hand, and to make sure of limiting the penetration the tip of the forefinger (index finger) (Fig. 69) should be placed firmly on the camila. With one push the abdominal wall should be punctured. The point of puncturing chosen is usually the deepest place of the abdomen and either in the linea alba or close beside it preferably, while the animal is standing. The place to insert the catheter is generally about the umbilical region, on or to one side of the linea alba. The animal should be placed in a standing position. Should the canula become plugged either by the omentum or intestines coming against the opening of the canula, it should be pulled downward, or moved to one side or introduce a thoroughly disinfected elastic catheter and push them to one side. After the fluid has ceased to flow, remove the catheter at the same time compressing the channel of puncture for several minutes from the sides and paint the opening with collodion, and place a firmly wrapped Priesznitz compress about the abdomen. Many advise administering injections of antiseptic, irritating or astringent fluids (boric acid water, salicylic acid water, Lugol solution, suprarenin solution, chloral hydrate, etc.) in connection with this operation but they are useless in case of genuine ascites.

The other changes in the peritoneum have no special value. Tubercular masses, sarcomas, and carcinomas have been already mentioned; also parasites. Plerocercoides bailleti (thick worms 1-2, seldom 10 cm. in length, 1.5-3 mm. in width) are found free or partially encysted, also the pentastomum denticulatum was found by Rochefontaine in great numbers in the subperitoneal cyst of the liver and mesentery, and here also have been found the bladder cysts of the tænia echinococcus. Eustrongylus gigas and large round worms are found but rarely lying free in the abdominal cavity.

DISEASES OF THE LIVER.

Catarrhal Jaundice.

(Icterus Catarrhalis; Icterus Gastro-Duodenalis)

Etiology.—In catarrh of the stomach we often find symptoms of jaundice with that disease, which may also be caused by the inflammation spreading to the excretary channels of the liver from the ductus choledochus, especially where the inflammation of the mucous membrane extends to the duodenum, and the ductus choledochus becomes closed by the swelling of its mucous membranes and prevents the exit of the bile by a mucous obstruction (plug) in the bile duct. As soon as such an obstruction occurs, the bile can no longer flow into the intestines; it becomes stagnant and dams back, causing a pressure on the bile-ducts, and being unable to escape, it finally enters the lymphatic vessels of the liver, from them into the blood through the thoracic duct. After this there follows a series of peculiar symptoms that have been named jaundice (icterus). In the early stages of the disease we have to deal with an icterus that is produced by stagnation of the bile. It has been found by observers that the pathological or artificial stoppage of the flow of the bile, and, consequently, damming back of the bile, will produce jaundice in forty-eight hours, causing in the dog the most conspicuous symptom of jaundice, the yellow discoloration of the tissue of the conjunctiva. This has a number of names—stagnating icterus, icterus of reabsorption, or hepatogenous icterus. We are therefore dealing at present with icterus produced by an obstruction; and it is understood that the catarrhal icterus frequently represents only a subdivision of the so-called "obstruction—icterus" (icterus per stasin, mechanical icterus). While the swelling of the mucous membrane is generally the cause of this disease, still there are a number of other pathological causes that may also produce it, such as foreign bodies in the ducts (parasites, gallstones, etc.), from ulceration of the mucous membrane, by the cicatrical contraction of tumors, or abscesses in or near the liver, from intestinal parasites invading the bile-duct, from the bile being very dense and flowing slowly. Contrasted with this obstructional icterus we have the diffuse icterus caused by functional disturbance of the liver cells and resulting in the bile being driven into the blood. The bile driven in an opposite direction (Minkowski), is observed diffuse icterus (icterus per paranedesen), in certain forms of diffuse hepatitis, in disturbance of the blood circulation of the liver due to thrombus in the portal arteries, heart diseases, the presence of bacteria (colibacilli), which have entered the liver from the intestines; from the eating of decayed meat and from certain infectious diseases, and in some cases of poisoning from phosphorus, chloroform, etc. The stopping of the flow of bile sets up an inflammation of the tissues and sometimes forms abscess of the liver, but as the great majority of cases are caused by the catarrhal form, we will describe that. Any cause that will produce catarrh of the stomach will finally produce icterus, such as improper food, especially when it is frozen; cold drinks after over-heating; salt meat, or salt fish. That form of icterus that is so often seen during distemper is very likely to be catarrhal.

Pathological Anatomy.—The symptoms of catarrh of the duodenum are always present; the vessels are more or less injected, and the mucous membrane is always very swollen. As a rule, the mouth of the duct (ductus choledochus) is closed, and it is only by very strong pressure on the gall bladder that we are able to open it and force the bile out of the duct. In some cases a white clot of mucus is forced out and when the duct has been plugged up some time the bile is converted into a syrupy or semi-solid mass, but in the majority of cases it is due to swelling of the intestines and not to catarrh of the mucous membrane of the duct.

In some post mortems, we may not find any swelling in the region of the duct, but very frequently the post-mortem changes are so quick as to be hardly recognizable at the autopsy. Another fact to be taken into consideration, is that the canal is so very narrow in the dog that it takes a very small amount of swelling to obstruct it.

The body of the liver may be changed; it is generally enlarged and anæmic, and varies in color from a yellow to a yellowish-brown. The color is irregular and it is mottled like a nutmeg. The cells of the liver are infiltrated and filled with globules of fat, colored with brownish pigment, in the shape of granulated clots. The cadaver is generally anæmic; the blood is clotted in the heart and large blood vessels or we find large lumps of hard reddish-yellow coagulate, or the blood may be stained yellow and contain white blood corpuscles in increased quantities. The red blood corpuscles are not much changed, but vary in size. All the tissues of the body, except the white substance of the brain, the spinal cord, the peripheral nerves and the corneal tissue, are stained more or less by the bile-pigment. The heart muscle undergoes a certain amount of fatty degeneration. The kidneys are anæmic; in the pale portion of the kidney we see extensive whitish stripes running in the direction of the urinary canals; this is caused by an irregular fatty degeneration and pigmentary infiltration of the canals (Siedamgrotsky).

Clinical Symptoms and Course of the Disease.—As this disease is generally associated with catarrh of the stomach, the first symptoms in jaundice will be of that disease—loss of appetite, increased thirst, vomiting, coated tongue; in some rare instances, however, these may be absent, the first symptom being that of jaundice (yellowishness of the mucous membranes).

When the bile and bile acids enter the blood the following symptoms are observed:

1. By the entrance of the coloring matter of the bile into the tissues, they become more or less yellow, first yellowishness of the conjunctiva and sclerotic coat also of the præputium (penis); later the whole cutaneous covering becomes tinted. The yellowishness may be very plainly seen on the abdomen, on the inner fascia of the thighs, the inside of the ears, and the mucous membrane of the mouth and throat; the color may range from a light yellow to a dirty orange-yellow; the latter color generally spreads over the entire body in the later stages of the disease.

2. On account of the coloring matter, secreted by the kidneys, being present in the urine, it is changed from the normal to a yellowish-green or to a dark greenish color; yellowish-brown and sometimes even beer brownish; when put in a vessel and agitated it foams very quickly and if a piece of paper or linen is placed in it, it becomes tinted the color of the bile. It is also easy to detect the presence of bile color of the urine by chemical examination. (For further details, see the chapter on the Examination of the Urinary Apparatus). Besides the bile acids, the urine in icterus cases almost always contains albumen, short hyaline casts, containing considerable pigment granulations, and epithelium of the kidney and fat droplets.

3. On account of the stoppage of the flow of bile into the intestines, the fæces become gray or clay-colored and contain much undigested fat, and hydrobilirubin is present. The fat substances not being digested, the fæces become very fœtid; this change is due to the loss of the antiseptic effect of the bile, and as the food is passed along the intestine the tonic effect of the bile is absent. Usually constipation occurs. In order to answer the question whether icterus depends upon a mechanical prevention of the discharge of bile we must first consider the nature of the fæces.

4. The bile acids present in the blood produce a certain amount of depression of the nerve-centres, and for this reason we find that the pulse and respiration are subnormal in action, and the temperature is reduced (sometimes several degrees). Other symptoms of the narcotic effect of the bile are seen in some cases where there is depression, great muscular debility, indifference to surroundings, somnolence and finally deep coma; we also find hemorrhagic conditions of the skin or mucous

membrane (cholæmia, icterus gravis). Sometimes clonic-tonic, cramps of individual groups of muscles (masticating muscles, abdominal muscles) can be observed, and sometimes hemorrhages in the skin and mucous membranes. The latter symptom is very serious.

The local examination of the liver gives very little satisfaction. The writer has never been able, except in one case, to find any perceptible enlargement of the liver. Manipulation of the liver does not seem to give the animals pain in the later stages of the disease. The prognosis in the dog is generally unfavorable. The yellow coloration gradually becomes deeper, the temperature falls to subnormal in the majority of cases, often to 30° C. and below, the pulse becomes weak and irregular, and finally death occurs with the symptoms of general paralysis. If the cases progress favorably, the first sign is a lessening of the coloration of the urine and a darker hue to the fæces; the pulse becomes fuller and more regular, the temperature increases, the animal shows more animation, and the color in the mucous membrane and especially of the skin becomes lighter, until it finally disappears. If there is a relapse, it is generally by improper feeding.

Therapeutics.—We must first aim to reduce the irritation of the duodenum, also the bile-ducts, and produce a discharge of bile ingredients located in the body tissues. This is first effected by regulating the diet, especially by avoiding all foods rich in fat and by administering plenty of liquid diet; suitable foods are, small quantities of lean meat, milk, purees, gruel, and besides this giving saline subcutaneous or intravenous injections of physiological salt solutions and then laxatives and alkaline in the form of carbonates and carbonic acid, if the constipation is persistent. Strong purgatives have been recommended, such as calomel, castor oil, and infusions of rhubarb; but they are of no particular value; in fact, in the majority of cases, they do more harm than good, as they have a tendency to swell the mucous membrane. Enemas of warm water (0.5-3 liters of water, 15-20° C., with a small quantity of soda or salt added) two or three times daily and Carlsbad salts are very useful. Sodium salicylate, salol, and subcutaneous pilocarpin injections (0.005-0.01; then 5.0 potassium tartrate 2-3 times daily) are recommended. We can also try to empty the gall bladder mechanically, by pressing (rubbing and massaging carefully in the right hypochondrium), the abdomen between the fingers in the region of the right hypochondrium, also by faradization—a strong current is to be applied in the region of the liver on both sides of the abdomen; this must be kept up for ten minutes at a time, twice daily. Or we may use emetics, as was done, more formerly than now, at the beginning of the treatment; it being claimed that the compression of the liver during emesis, the violent contraction of the abdomen, will often empty the gall bladder. We can also try to carry the bile out of the system by the kidneys. The best drugs to use are diuretics, such as acetate of sodium or potassium. Where there is great debility or depression we can use spirits of camphor or ether. Boldine, the alkaloid of the Pennus boldos, has recently been spoken of as producing good results in jaundice; it is given in doses of 0.08 gramme daily with calomel. Great weakness or persistent sleepiness can be treated with camphor, ether, and caffeine.

℞	Sal. Carolin. fact.	10.0
	Aquæ	150.0

M. f. Sig.—One tablespoonful three times daily.

℞	Sodii salicylatis	4 to 10.0
	Syrupi Rhei	200.0

M. f. Sig.—One tablespoonful morning and night.
(Cadiat and Breton.)

℞	Ac. Tartaric	15.0
	Aquæ destilata	200.0

M. f. Sig.—One teaspoonful three times daily.

Other Affections of the Liver.

The other affections of the liver are of slight importance and are rarely met with during life, consequently they will be only mentioned briefly.

Hyperæmia of the Liver.—This may be caused either by an increased or obstructed flow of the bile, and therefore it is important to be able to distinguish between the two.

Congestive hyperæmia of the liver is a normal condition during digestion; it may be abnormally increased by eating large quantities of food, especially if it is rich and irritating, and from want of exercise; irritating, decayed or tainted food may also cause this condition. This condition may also occur as a forerunner of hepatitis, and may also be caused by severe exertion, shock or great heat. In case of certain infectious diseases the liver may be noticeably plethoric.

Stagnating hyperæmia of the liver may be caused by defective valvular action of the heart or a weakened condition of that organ; in the later stages of acute diseases, such as the lungs; by chronic lung diseases. In cases where large numbers of the lung capillaries become atrophied and useless; in great pleuritic exudations; in extensive induration of the lungs, with emphysema; and also in dropsy of the pericardium.

Pathological Anatomy.—The liver is greatly enlarged and very hard; when a section is cut in it, the blood seems to run out of it in large quantities. This liver generally is dark colored, especially if the stagnation has been prolonged. The liver tissue may be spotted, the spots corresponding with the central veins which are located in the centre of the lobules; or we may notice peripheric zones (nutmeg liver) alternating with lighter colored spaces. The liver may gradually become smaller and its surface dull, and later on the parenchyma finely granular (atrophic nutmeg liver).

Clinical Symptoms.—It is not possible to make a positive diagnosis of this disease, we can only suspect it by great tenderness on pressure in the region of the liver, and perhaps slight icterus, ascites may accompany atrophic nutmeg liver, but as these symptoms may all be caused by catarrh of the bowels, it is well to be very cautious before making a positive diagnosis.

Therapeutics.—Remove the cause if possible, regulate the diet and administer saline laxatives, especially Carlsbad salt. Furthermore Priesznitz compresses in the region of the liver may be prescribed.

Inflammation of the Liver (Hepatitis).—This disease appears in three forms—parenchymatous, interstitial and purulent.

1. Parenchymatous hepatitis may be caused in the same way that we see congestion of the liver. It is seen as a symptom of acute phosphorus-poisoning, also as an accompaniment of certain infectious diseases.

The especially conspicuous pathological-anatomical alterations are as follows: Enlargement, softening, and a friable condition of the tissue, which breaks easily to the touch. At first it is dark red, but later on it becomes a yellowish clay color, protrusion of the enlarged acini, above the broken surface, the capsule is dull and thickened, due to a certain amount of perihepatitis. If the disease lasts any time, the volume of the liver is greatly lessened.

The clinical symptoms are, evidences of catarrh of the stomach, pain on pressure in the region of the liver, icterus, utterances of pain at defecation, and it is sometimes possible by palpatation and percussion to determine an enlargment of the liver. The treatment resembles in general that given for congestion of the liver.

2. **Interstitial Hepatitis (Cirrhosis of the Liver) (Hardening of the Liver).**—This disease originates from causes that are at present unknown. There is no doubt that certain chemical or bacterial poisons which originate in the intestines, for example from highly seasoned or decomposed kitchen refuse, have some part in causing this disease. Friedberger aind Frohner surmise that it is caused by valvular disease of the heart, or other chronic obstructional processes.

Pathological Anatomy.—There are two stages in this disease. In the first stage (hypertrophic cirrhosis), the liver is uniformly enlarged and hard, the edges of the lobes are blunt, on the surface, at first smooth, then later there are a number of uneven depressions. On making a transverse section, we find a net-work of reddish-gray tissues that surround the lobules; later on this involves the lobules themselves. In the second stage (atrophic cirrhosis) we find a cicatricial contraction of newly formed tissue, and at the same time the disappearance of the true tissue of the liver. The liver then becomes gradually smaller, firmer, harder, and has a very irregular surface; the capsule is thickened and in some places depressed; the tissue is hard and tough when cut with a knife, and is, as a rule, of a conspicuously light yellow color.

Clinical Symptoms.—The disease generally starts without any visible symptoms, although it is a common disease in old dogs that have lived well. When the disease has become pretty well advanced we find evidences of an interference in the portal circulation by the appearance of ascites and chronic catarrh of the stomach. With these symptoms we also find a tendency to constipation with occasional changes to diarrhœa. In many instances a moderate amount of icterus is present. This is due either to the interference with the passage of the bile from the gall bladder by catarrh of the duodenum or to a contracted condition of the small bile-ducts. There is no pain on pressure in the region of the liver at least in the advanced stages of the disease. After removing the ascites fluid, the outline of the changed liver can be felt by palpation.

The disease is generally very slow, but ends fatally; when there is ascites and some œdema of the extremities present, the end is not far off.

Therapeutics.—This consists in treating the case, after it has reached the stage in which it can be diagnosed clinically, as if it were one of chronic catarrh of the stomach and intestine by means of saline purgatives and, as if ascites were present, by puncture. In addition potassium iodide (per day 0.5-1.0) can be given for some time. The disease should be regarded as incurable.

3. **Purulent Inflammation of the Liver (Abscess of the Liver).**—This may be caused by injuries, such as blows or kicks, externally, or from foreign bodies penetrating the liver from the stomach or perforating abscesses coming from the stomach, as well as from metastasis from phlebitis and thrombus undergoing purulent destruction, and from pyæmia in abscess of the stomach, and in the bile-ducts from the presence of gall-stones or parasites.

Pathological Anatomy.—Abscesses of the liver appear singly but may be present in large numbers; the traumatic abscess is generally solitary and the metastatic, almost always multiple. The pus is creamlike and in some instances fœtid and reddish, or green in color. Small abscesses may heal by absorption, but the large ones sometimes open into adjoining parts and if they open into the abdominal cavity cause fatal peritonitis.

Icterus symptoms, accompanied by irregular fever with occasional chills, and by digestive disturbances, might point to abscess of the liver. Palpation and percussion of the region of the liver produce satisfactory results only in very rare cases. Treatment is practically useless.

Fatty Liver (Hepar Adiposum).—This is an abnormal diffuse fatty infiltration of the cells of the liver. It is hard and seems anæmic when the section is made through the organ. The cells are found to be infiltrated with fatty globules and the nuclei pushed to one side.

This condition is seen in old dogs that have been well fed and had little exercise, and is naturally a fatty infiltration. It must, however, be distinguished from the fatty degeneration that is found to follow several poisons, and in the later stages of consumption. In fatty infiltration the blood of the portal vein carries abnormal quantities of fat into the liver, which is deposited in the cells. In fatty degeneration the fat originates in the cells themselves; this is due to the albumin separating into two substances. One contains nitrogen, while in the other it is absent. This latter part undergoes fatty degeneration.

The treatment of fatty liver is the same as for any adipose condition.

Neoformations of the Liver and Gall-stones.—The neoformations found in the liver of the dog are sarcomas, carcinoma, adenoma, hæmangioma, and lipoma. These forms all, but especially carcinoma of the liver (liver cancer) can, under certain conditions, cause enormous, knotty, irregular enlargements on the body of the liver, and then produce symptoms similar to those of cirrhosis of the liver. Sometimes large tumors can be felt through the abdominal wall. Treatment would be useless.

These have been observed often and are located in the gall bladder or bile ducts. Small stones may pass through the ductus choledochus without producing any symptoms of disease into the colon and from there be passed with the fæces; larger stones may cause colic (gall stone colic) in the passages and by interfering with the discharge of the bile produce icterus.

Frohner describes one case where the animal died with an icterus gravel. Immediately after death he found in the ductus choledochus a large bluish-black friable gall stone, the size of a pea. On section, this was brownish-yellow in the centre. Parascendolo described one case where the ductus choledochus was impacted with a mass of stones. The only way that they might be recognized would be the appearance of icterus, from retention, preceded by intense colic.

Treatment is the same as retention icterus; small gall stones may be present in the gall bladder without causing any peculiar symptoms, other than slight disturbance of the digestion.

Parasites.—The following parasites have been found in the liver: distoma truncatum, distoma campanulatum, and distoma conjunctum. Distomafelineum and Distoma albidum) also Eustrongylus gigas and coccidia. (Ercolani). In the bile-ducts, ascarides have been found, Ercolani and Lissizin found a fully developed male eustrongylus gigas and coccidia (Rivolta), also the bladder cyst of the echinococcus.

Amyloid and Lardaceous Liver.—Amyloid liver, as a rule, is a symptom of a general amyloid condition, developed from a cachectic state, from prolonged suppurating wounds or from chronic inflammation of the pectoral membranes prolonged exhausting diseases.

The liver is generally very much enlarged and blunt on the edges of the lobes; its consistency is soft. On section, the cut surface is speckled, the central zones of the acini appear reddish-brown, the peripheral yellowish-red. On microscopical examination the walls of the capillaries will be found to have undergone amyloid degeneration; when stained with Lugol's iodine solution, the degenerated portions become mahogany-brown in color. It is worth noting that amyloid liver often leads to rupture of the liver and to internal hemorrhage.

Lardaceous liver is developed when we have a disease that has a tendency to produce amyloid degeneration. The liver becomes very large. With it we generally find amyloid kidney with albumin in the urine and we also are apt to find an amyloid spleen. The treatment is hopeless.

POISONS.

A short abstract on poisons with their symptoms and treatment is here given; it is not at all complete, and the student is referred to works on toxicology.

Poisoning by Caustic Alkalies.—Caustic lime, soda or potassium, lye, sal. ammoniac, soft—and other sharp soaps, etc. These in their concentrated form may be administered accidentally, or may have been used in some external preparation and licked off by the animal. Caustic soda or potassium may be swallowed by animals that are very thirsty. The writer observed a dog that was poisoned eating meat that had caustic lime sprinkled on it.

The lips, mouth, tongue, throat, and œsophagus are more or less cauterized, with salivation, difficulty in swallowing, symptoms of colic, and vomiting of strongly alkaline materials, which is sometimes bloody. In rare instances there is bloody diarrhœa. The potassium preparations cause paralysis of the heart.

The treatment consists in a neutralization of the alkalies by the administration of vinegar or acetic acid, gruels of flour, oat meal, starch, emulsions of oil (olive, linseed, or cottonseed) solution of gum (1:10) and milk. If necessary opium may be given in connection with this treatment. Analeptica (stimulants) are given in case of collapse. The giving of emetics or the use of the stomach pump is contra-indicated, as they are apt to cause perforation of the stomach.

Poisoning by Caustic Acids.—This is of rare occurrence and is generally caused by the insufficient dilution of medicinal preparations, or the vicious administration of acids.

The mucous membrane of the mouth, throat, and œsophagus, and under certain conditions that of the lips and adjoining regions, is eroded or burnt brown. There is salivation gagging, difficulty in swallowing, and vomiting of a brownish-black material, with a strong acid reaction, which contains more or less blood, violent pain, urine sometimes containing albumin or blood, small thready frequent pulse, and finally collapse.

Therapeutics.—Emetics and the stomach pump are contra-indicated, as there is danger of perforation. Generous administrations of magnesia usta, soap water. Limewater, dilute ammonia or soda solutions, afterwards gruel, milk, emulsions of olive, linseed, or cottonseed oils, small quantities of opium, and in case of collapse the subcutaneous injection of ether or camphor. (In administering carbonates (soda, magnesium carbonate, chalk) the development of CO_2 and gastric flatulence must be taken into consideration; for that reason sodium bicarbonate is contra-indicated).

Poisoning by Arsenic.—This is sometimes given intentionally on pieces of meat, or caused by eating some of the various rat poisons, or Scheele's green, less often by the overdosing of Fowler's solution, or licking external preparations that contain arsenic.

There is violent inflammation of the stomach and intestines, great restlessness, salivation, later putrid, often bloody diarrhœa, vomiting and dyspnœa, great weakness, and finally collapse and death in a few hours.

Therapeutics.—Emetics (Apomorphine subcutaneously) and iron preparations, the hydrated sesquioxide of iron every quarter of an hour, carbonate of magnesia, a teaspoonful every twenty minutes, followed by alcoholic stimulants. Limewater, sugar water, white of egg, gruel can also be given, followed by laxatives. Fatty oils, including ricinus oil, are to be avoided. The stomach pump can be used, if there is not prompt emesis.

Poisoning by Hydrocyanic Acid; Prussic Acid.—This is generally given intentionally, in the form of cyanide of potassium, rarely the pure acid. There is an odor of bitter almonds on the breath. The symptoms are vomiting, yelping cries, dyspnœa, convulsions of the legs, and death in a short time. If the dose should be small, there is restlessness, fear, dyspnœa, dilated pupils, convulsions of the extremities, fall in temperature until it is subnormal, marked slowness of the respirations and pulse, cyanosis and unconsciousness. If the course of the disease is very rapid the color of the blood is bright red, otherwise dark brown.

Therapeutics.—Death generally results so quickly that preventives are of no avail. We can mention the following: Emetics, artificial respiration (rhythmic pressure of the lower abdominal walls, bathing in cold water, stimulants, chlorine water, smelling aqueous ammonia, strong coffee, solution of chloride of lime (4.0 chloride of lime: 200.0 water to which has been added several drops of hydrochloric acid), hydrogen superoxide (every minute a Pravaz syringe full of 3% hydrogen peroxide, as long as the breath smells badly: Kobert), potassium permanganate, sodium thiosulfate (0.1-0.2 subcutaneously or intravenously), cobaltous oxide nitrate. Ferrum hydricum in aqua, scopolamin and subcutaneous injections of atropia.

Poisoning by Carbolic Acid.—This is quite frequently observed and is caused by the animal licking external preparations which contain the drug; this is frequently seen as a result of the use of some of the various preparations sold under the name of creolin, which are nothing more than crude carbolic acid, or some coal tar by-product, and the animal is bathed frequently in a strong solution of it. It may also be caused by the animal licking a wound or the wound absorbing carbolic acid, tar or creosote which has been applied as a dressing. It may also be absorbed following the injection of strong solutions of carbolic acid into the uterus. The urine is dark in color, frequently a dark olive green, there is slight colic, pain on pressure of the abdomen, vomiting, diarrhœa, great inflammation and redness of the mouth, marked weakness, decrease in the temperature, twitching of the muscles, paralysis, convulsions and collapse.

Treatment.—White of egg, glauber salts, and stimulants.

Poisoning by Iodine, Potassium iodide, Iodoform.—This may be caused (occurs seldom) by licking wounds dressed with the drug and also from the injections of too strong solutions into cysts, goiters, joints, etc., or by a treatment of iodine or potassium iodide that has been continued too long. In very large doses we find great gastric disturbance, with lack of appetite, vomiting, etc., dyspnœa, deafness, small, frequent pulse, decrease in the internal temperature, suppression of urine, albuminuria, and convulsions, alternated with great excitement and finally collapse. In smaller doses we find chronic course catarrh of the mucous membranes, emaciation, and skin eruptions.

Therapeutics.—In the acute form give emetics followed by carbonate of potash, large quantities of starch, sodium thiosulfate as a stomach wash or internally (5.0-10.0: 100.0 aqua dist. given tablespoonful at a time), flour gruel, sodium sulfanilicum, subcutaneous injections of atropia. Generally used symptomatically, especially as excitants (alcohol, strong coffee, camphor, atropin), and sedatives in case of cramps. In the milder forms carbonated and vegetable acid alkalies, saline laxatives, tonics and, of course, immediately remove the cause.

Poisoning by Phosphorus.—This may be caused by the animal eating some of the various roach or bug poisons that have been spread on bread and placed in a cellar or building. There is constant sometimes bloody vomiting, the odor of the ejected matter may be that of phosphorus, and if taken into a dark room may be luminous.

There is great restlessness, howling, whining, fever, difficulty in swallowing, diarrhœa, and indications of intense irritation of the mouth and throat; and the saliva is thick and copious. After these symptoms have been present for some time, the animal becomes quiet, very feeble, the pulse grows weaker, almost imperceptible, the body temperature decreases, the mucous membranes become dirty yellow, great pain on pressure on the liver, stomach, and intestines. The fæces are tinged with blood and there is albuminuria; and according to some authors, if there is any icterus in a suspected case, it is a clear indication of phosphorus poisoning; finally, there is paralysis and collapse.

Therapeutics.—Use sulphate of copper as an emetic, and turpentine in emulsion as an antidote, and treat other symptoms as they appear. Permangante of potash, nitrate of cobalt, heavy magnesia, are antidotes. Under no conditions use fats or fatty oils, also no milk as antidotes. In the later stages excitants or stimulants are necessary.

℞	Cupri Sulphatis	1.0
	Aquæ destillatæ	50.0

Sig.—Give a tablespoonful every ten minutes until emesis occurs.

℞	Ol. Terebinthinæ	20.0
	Sol. Acacia	50.0
	Aqua. distil.	200.0

Sig.—A tablespoonful, after shaking, every fifteen minutes.

Poisoning by Mercury.—1. Acute poisoning by corrosive sublimate is very rare. The symptoms are intense inflammation of the entire intestinal tract, vomiting of blood and bloody diarrhœa, with intense local irritation followed by symptoms of paralysis and death.

2. **Mercurial Poisoning** takes a slower course when caused by calomel or mercurial dressings, particularly when mercurial (blue) ointment is applied for skin eruptions. We find salivation, catarrh of the stomach, lack of appetite, ill smelling odor from the mouth, profuse diarrhœa, emaciation, with marked muscular debility.

Therapeutics.—In the acute form give gruels, milk, magnesia, water, animal charcoal, iron preparations, sulphur, liver of sulfur, symptomatic treatment, sulphur, iodide of potassium, stimulants. In the slower form of poisoning, give iodide of potassium, or sulphur, nourishing food, and increase of salivary action.

Poisoning by Strychnia.—This is frequently administered intentionally, although it is often caused by the administration of too large doses of nux vomica, dogs being particularly susceptible to the action of strychnia, or by dogs devouring bait containing strychnine—intended for vermin. There are violent tetanic spasms, trismus, and opisthotonus, or orthotonus. The animal also is very easily frightened. The slightest outside irritation, e. g., lifting the animal and administering antidotes or sedatives, will usually cause a new attack. The convulsions are clonic, having intermissions between them, and the longer the intermission the milder the attack and the more chance of a recovery.

Therapeutics.—Give narcotics, chloral hydrate in clysters, 2.5 grammes to 40.0 of water; less advisable are morphia (subcutaneous), chloroform (as inhalation), and potassium bromide (as "Clysma"). Atropin is also named and under certain conditions artificial respiration. At first, in case of internal poisoning, an emetic (apomorphin, subcutaneously) can be prescribed. Chemical antidotes of strychnine are weak solutions of tannic acid and iodine-potassium iodide solution, tannin, and tincture of iodine.

Poisoning by Chloroform.—This is caused either by the careless administration of chloroform during anæsthesia, or when animals are old or have weak hearts or lungs and by the use of an impure preparation. It destroys sensibility and reflex action, followed by irregular, weak pulse, dilated pupil, the blood becomes very dark and there is congestion and cyanosis of the visible mucous membranes, arrest of respiration and pulsation. Animals that are easily excited sometimes die shortly after beginning the inhalation.

Therapeutics.—Cease the inhalation immediately, put the animal in the fresh air, open the mouth, draw out the tongue by means of a pair of forceps, and perform artificial respiration and heart massage. Dash cold water on the head, active friction of the skin, and the subcutaneous injection of atropia, skopolamin, or strychnia.

℞		
	Atropia sulph.	0.05
	Aquæ distil.	5.0

Sig.—Inject a gramme of the solution subcutaneously.

Poisoning with Gas (Coal, Carbondioxide, or Illuminating).—Great lassitude, insensibility, labored respiration, mydriasis, cyanosis, small or imperceptible pulse, decrease of body temperature, sometimes convulsions, and finally complete paralysis.

Therapeutics.—Fresh air, artificial respiration, dash cold water on the head, active friction of the skin, smelling salts, bleeding, and the intravenous injection of the physiological solution of chloride of sodium, excitants (black coffee).

Poisoning by Iodine.—This may result from the licking or the absorption of iodine, particularly when it is used in the injection of cysts in the form of iodine or Lugol's solution.

The symptoms and course are very similar to iodoform. After a toxic dose there is stomatitis and pharyngitis, brown patches on the tongue and the vomiting of brown material, and if starch should be present in the stomach in any quantity, the material is turned bluish in color. The free administration of starch solution, and sulphate of soda and sulphurette of soda in solution 1 to 20 of water, must be given freely in teaspoonful doses.

Poisoning by Fern Extract.—(By administering too great a quantity in treating tapeworms and by overlooking the fact that there is a great difference between the toxicity and efficacy of a preparation; filmaron is also poisonous). The symptoms are those of gastroenteritis and nephritis; also numbness, attempts at defecation, cramps, amaurosis, increasing bodily weakness and paralysis.

Therapeutics.—Under no conditions give fats or fatty oils; but administer gruel like substances, and excitants.

Poisoning by Phenol (chiefly by licking off medicines externally applied which contain carbolic acid, creolin, lysol, bacillol, creosote, tar, etc., less often caused by resorption through the skin, from wounds or mucous membranes or by the accidental overdose from internal use). The symptoms are as follows: Urine becomes dark, olive green to brownish black in color (this discoloration is usually not evident until the urine has been exposed to the air for some time), slight colic symptoms; pains on pressure of the abdomen, vomiting (the substance vomited evinces the characteristic carbolic odor), diarrhœa, sometimes irritation in the mouth with salivation and difficulty in swallowing, feebleness, trembling of muscles; in severe cases a decrease in temperature; dyspnœa; cramps, paralysis, collapse.

Therapeutics.—Sulphuric acid and alkaline sulfates, sugar-lime (calcium sucrate, calcaria saccharata, given in knife-tip doses in water), chalk, lime water, soap water, fatty oil, white of egg, milk and in addition use excitants, the stomach pump, etc.

Poisoning by Santonin.—Caused by overdoses in treating large round-worms, and especially overlooking the fact that many whelps are particularly sensitive to Santonin. The symptoms are: lack of appetite, slight colic, polyuria, albuminuria, cerebral disturbances, dizziness, trembling, staring expression, tottering, alterations of the pupils, epileptform convulsions, somnolence. Acid urine is greenish to reddish yellow, alkaline onion to purplish red.

Therapeutics.—Emetics and laxatives; symptomatic treatment. Chloralhydrate to be administered for convulsions. Concerning poisoning by meat and snake bites information will be given elsewhere in the book.

DISEASES OF THE RESPIRATORY ORGANS.

Physical Examination of the Respiratory Apparatus.

In making an examination of the respiratory apparatus the following points are to be considered:

Condition of the Nose.

It is a rather hard thing to make an examination of the nasal cavity of the dog on account of the anatomical conformation of that part, and we are practically restricted to the inspection of the so-called "mirror of the nose," i. e., the hairless front part of the nose, and of the examina-

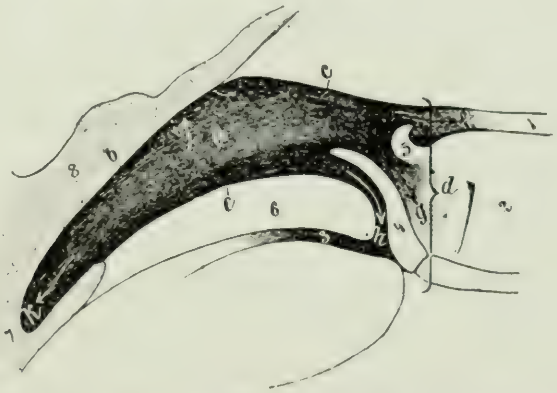


FIG. 70.—Diagrammatic section of the pharynx: *a*, pharnyx; *b*, palate; *c*, soft palate; *d*, epiglottic wall; *e*, frænum; *f*, entrance to œsophagus; *h*, entrance to the mouth; *i*, entrance to the Eustachian tube; *k*, entrance to the nasal passages; 1, epiglottis; 2, larynx; 3, cavity of the mouth; 4, epiglottis; 5, arytenoid cartilage; 6, palate; 7, vomer; 8, base of skull.

tion the nasal discharge and the condition of the breath should be taken into consideration, and the character of the nasal secretions. The external hairless portion of the nose is generally colored black, is without glands or pores, moist and cold in health, colder than any other part of the body, and dry and warm when a dog has any fever or elevation of temperature, in the first stages of nasal catarrh, and in fevers or acute disease. This should not be taken as a positive evidence, as frequently cases are seen where this is no guide, the nose being cold when there is great fever or the animal in a state of collapse. This cold tip of the nose contains the secretion that normally covers it and that comes from certain serous glands inside the nasal cavity; in the first place from the comparatively large lateral nasal gland whose excretory duct lying in the middle nasal passage ends near the outer nostril (Trautman). The serous secretion is led and distributed onto the bare external portion of the nose by a peculiar system of grooves.

Swelling, redness and excoriation at the entrance of the nasal chambers especially below the nostrils, and depending on conditions, with the formation of fairly light grooves in the direction of the secretion that is draining off, indicate prolonged inflammatory and purulent condition of the nasal mucous membrane. These conditions should not be confused with the changes of the skin (swelling, nodules, pimples, scurvy, scales) which may be seen near the nostrils in furunculosis, eczema, acariasis (mange), herpes (urticaria) and other skin diseases. With young dogs the occurrence of pustules or scurvy at such places causes one to suspect distemper and should lead to a thorough examination of the animal.

Any discharge from the nose, beyond a natural moistness, indicates some diseased condition. In cases of acute nasal catarrh it is clear and thin, nearly pure serum in the beginning, but later on it becomes mucous and finally muco-purulent. In chronic catarrh it is firmer, sticky, and finally very tenacious, and sticks to the external opening of the nose, often entirely closing it up and eroding the skin, where it comes in contact with it. In distemper it is grayish to grayish-green in color; sometimes it is streaked with blood or pus, and in rare cases it has a fœtid odor, is almost always connected with a mucous, later purulent discharge from the eyes. Its irritating action on the edges and region surrounding the nostrils is quickly seen and the nostrils are usually soon covered with a dried up nasal secretion in the form of yellow, grayish yellow or dirty grey scabs. In case of catarrh of the nasal sinuses the nasal discharge is generally greater in quantity and occurs more or less unilateral and is thrown out in considerable quantities usually by quick jerks of the head.

When the discharge is copious, especially when the head is jerked downward with a sneezing cough, it is generally a sign of some irritation of the frontal sinuses. A nasal discharge following coughing may also come from some trouble in the deep sections of the air-passages, larynx, wind-pipe, bronchi, or the lungs; a rusty yellow discharge indicates croupous pneumonia; this is, however, very rare. Frequent sneezing appears with great regularity at the beginning of all kinds of nasal catarrh. Frequent sneezing, with a copious, purulent, bad-smelling discharge mixed with blood points to the presence of foreign bodies that have become firmly lodged in the nasal cavity or to the presence of pentastoma tænioides in the frontal or nasal cavities. The diagnosis could be definitely established upon the discovery of pentastoma eggs in the nasal discharge. In cases of acute catarrh of the throat, foreign bodies in the mouth or throat cavity, paralysis of the larynx, or large tumors in the mouth or throat, the discharge from the nose may be mixed with some contents of the stomach. It is important to remember, however, that this symptom may be missing or in the dog is less evident than with other domestic animals. In case of the malformation known as "wolf's throat," which appears rarely, both food and drink again partly pass outward through the posterior nares and nasal canties because of the open communication between the cavity of the mouth and of the nose. Frequent true cases of bleeding of the nose are seen as a result of traniatic or mechanical action, also at the beginning of severe nasal catarrh, in hemorrhagic catarrh of that organ, also through tumors or ulcerous conditions in the nose, in suppurating conditions of the nasal cavities from the pentastome, and also in distemper and in many other diseases. Nosebleeding is also a fairly frequent symptom of dochmiasis. Hemorrhage of the lungs is indicated when there are large masses of frothy blood discharged from the nose and mouth. Wheezy respiration is generally due to some contraction of the nasal cavities, for instance in case of almost every severe head cold, also as a result of distemper, and as a consequence of violent nasal catarrh, tumors, fractures of the nasal bones, narrowing of the nasal passages, pressure from some of the neighboring organs, or solid collections of matter. In some breeds of dogs,

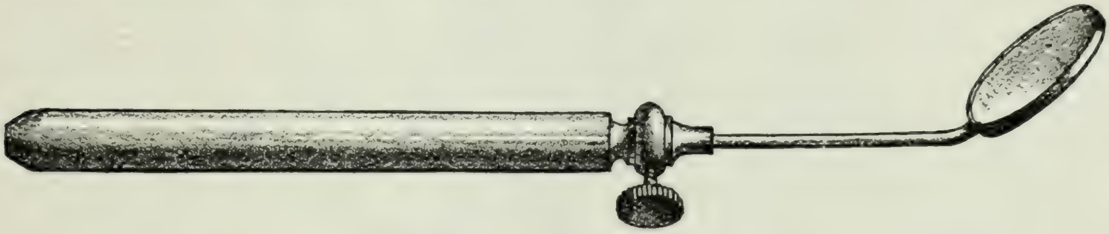


FIG. 70a.—Pharyngoscope.

such as pugs and bulldogs, the passage is so narrow that a slight contraction may cause them to breathe through the mouth. Wheezy respiration can also result from the contraction of the nasal cavities caused by surrounding swelling, dried up secretions, etc. A simple method of detecting whether the nostril is entirely obstructed is to hold a lighted candle in front of the nostril suspected and see if the flame is blown. If the nostril is clear the flame moves violently or may be blown out, but if the obstruction is complete or partial the flame moves slightly or not at all. In place of the candle we can hold our hand or moistened back of hand, or a mirror, especially a cold metal mirror, or a soft downy feather in front of the nostrils. The nasal sound is like a snore when copious accumulations of mucus have collected on the mucous membrane, as in distemper, or the later stages of simple catarrh of the nose. In addition to the snoring in coma or deep narcosis, it may also occur in case of tumors and severe inflammatory processes in the pharynx; occasionally dogs also snore in their sleep under normal conditions. In many of the affections named, e. g., at the beginning stage of colds, in distemper, pentastomum, when foreign objects (insects) get into the nose,

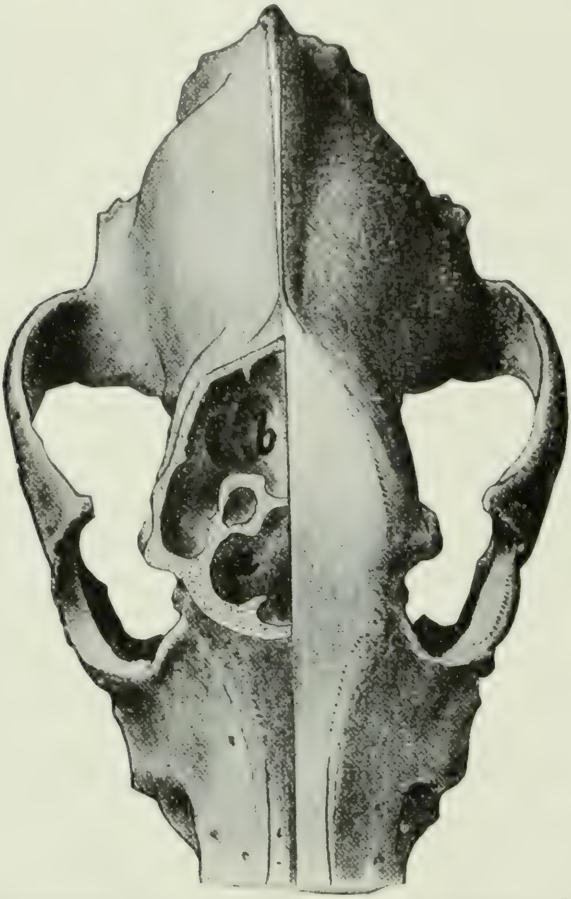


FIG. 71.—Position of the frontal sinuses: *a*, inferior; *b*, superior.

etc., many animals seem to have an intense itching, which they indicate by rubbing the nose against solid objects, or wiping it with the paws. We must recollect, however, that the same symptoms may be observed in an animal infected with intestinal worms, or perhaps also in stomach disturbances.

A **foul breath** accompanied by an ill smelling nasal discharge, is present in case of ulcerous and gangrenous processes in the nose and in its adjoining cavities, in the pharyngeal cavity, in the trachea and in the lungs, but may also appear with similar processes in the mouth, as well as in ulcerative stomatitis, caries of the teeth, etc.

The naso-pharyngeal region can be examined by means of the laryngeal mirror; when the presence of foreign bodies or pathological process, tumors, etc., is suspected, the mouth is held wide open by means of a speculum and the mirror introduced into the mouth into the pharynx and then placed between the arcus palatinus and oral surface of the epiglottis; this method of examination should be made as quickly as possible as the instrument chokes the animal; the observer must act quickly and have a thorough understanding of the region and any pathological symptoms noted.

Percussion of the nose and frontal sinuse is of less importance and is made with some light metal hammer such as the handle end of a key, percussing first one nasal bone and over the frontal sinuses, then the other, to note the difference in sound. A dull sound may indicate a catarrhal condition of the nostril, or frontal sinuses, the presence of a tumor, or some pathological alterations; or perhaps, if over the frontal percussing sound should not be taken as indicating that these changes or maxillary sinus, the sound of percussion may indicate an accumulation of fluid in these cavities; on the other hand, the presence of a clear are not present. Large tumors and chronic empyema in the adjacent sinuses by pressure cause changes or elevations on the nasal bones of the frontal sinuses; such alterations may also be seen in the hard palate, in case of tumors in the nasal cavity. Moreover such conditions may cause increase in warmth and sensitiveness to pressure as in percussion. Concerning the location of the frontal sinus which is insignificant in short headed breeds and sometimes is even missing entirely, explanation is given in ill. 71; the maxillary sinus is noticeably smaller, elongated oval in shape and lies in the niveau of the 3d to 6th molar.

The Condition of the Larynx and Windpipe.

The examination of the larynx includes the functions (voice, cough, respiration) of the larynx and the local symptoms. The symptoms include the bark, cough, and respiration, as well as the local symptoms. The bark is always rough, hoarse, or shrill in all affections of the internal larynx, and is always of great importance in diagnosing rabies (barking howl), or there may be a total loss of voice; this is particularly seen during or after dog shows. The cough is an accompaniment of all affections of the larynx; and in the later stages of catarrh, where there is much mucus, it is loose, moist, and rattling, and may be produced by slight pressure on either side of the larynx, by cold, pressure, or after drinking; in any chronic irritation of the larynx, any excitement, such as the pleasure of meeting a person they know, will start a severe coughing spell. The cough, however, which is one of the most constant symptoms of laryngeal diseases may also appear in affections of other parts of the respiratory apparatus and will be discussed in detail later. The respiration is always dyspnœic and accompanied by a stenotic bruit when the results of some diseased condition there is a contraction of the larynx. Auscultation of the larynx is generally performed by placing the ear directly on the larynx, sometimes by the use of a stethoscope or membrane-stethoscope. Normally the sound is a slightly wheezy respiration. This sound is noticeably loud and sharp in all cases of difficult respiration (dyspnœa) but the fact should not be overlooked that the laryngeal tones sound sharp and loud in a dog under normal conditions. Rubbing, creaking, or rattling sounds indicate more or less liquid accumulations (mucus, pus, or blood); wheezy, gasping, snoring sounds indicate severe swelling of the mucous membrane or tough mucus (chronic catarrh); it may also indicate the presence of tumors, membranous accumulations, and paralysis of the muscles of the larynx. Similar to these sounds are those heard during auscultation of the trachea (see later) in health as well as in disease.

A local external and internal examination of the larynx can be made. Externally the larynx can be examined to see whether it is swollen, as in acute laryngitis; for fracture or dislocation of the cartilages, for œdematous, phlegmonous, or emphysematous swellings of the part or its surroundings, swelling of the regional lymphatic glands located there, etc.. also an increased temperature and sensitiveness to pressure, always indicates some irritation of the larynx. The sensitiveness to pressure is indicated by evasion, resistance, whining, crying, etc., on part of the patient; usually also by coughing and for example in acute inflammatory processes of the larynx is a very commonly met symptom.

The internal examination of the larynx is very easy and simple, especially with short-headed dogs, except in cases where the animal is very vicious; the method of keeping the mouth open is fully described on page 21, and then by means of a spatula, or the handle of a spoon, the tongue can be depressed or pulled out of the mouth by means of the hand wrapped in a cloth or with a pair of blunt forceps; the examination should be made near a window or by means of a lamp or electric torch; the light can then be thrown into the posterior portion of the throat. Vicious animals may be put under ether or stupefied by morphine, when it is possible to hold open even the epiglottis for some time by means of a "corn" forceps or pincers. When the mouth is opened and the tongue depressed, we can easily see the entire pharynx and the upper wall of the larynx and epiglottis, and in some cases, especially when the animal cries during the examination, a part of the windpipe, and swellings, discolorations, hemorrhages, ulcerations, new formations, foreign bodies, paralysis of the vocal chords can be readily diagnosed; a good knowledge of anatomy and a quick eye is necessary, however. In acute catarrh the mucous membrane of the larynx is injected and red and covered with slimy white or yellowish mucus. In chronic catarrh it is not so red, but the mucous membrane has a number of bluish-red vessels running through it and covered with tough, glassy, or purulent mucus; the membranes are sometimes granular; we may also find at the entrance of the œsophagus foreign bodies, tumors, or abscesses. The trachea is examined externally by palpation to see if there is any change or dislocation of the rings, œdematous or phlegmonous swellings

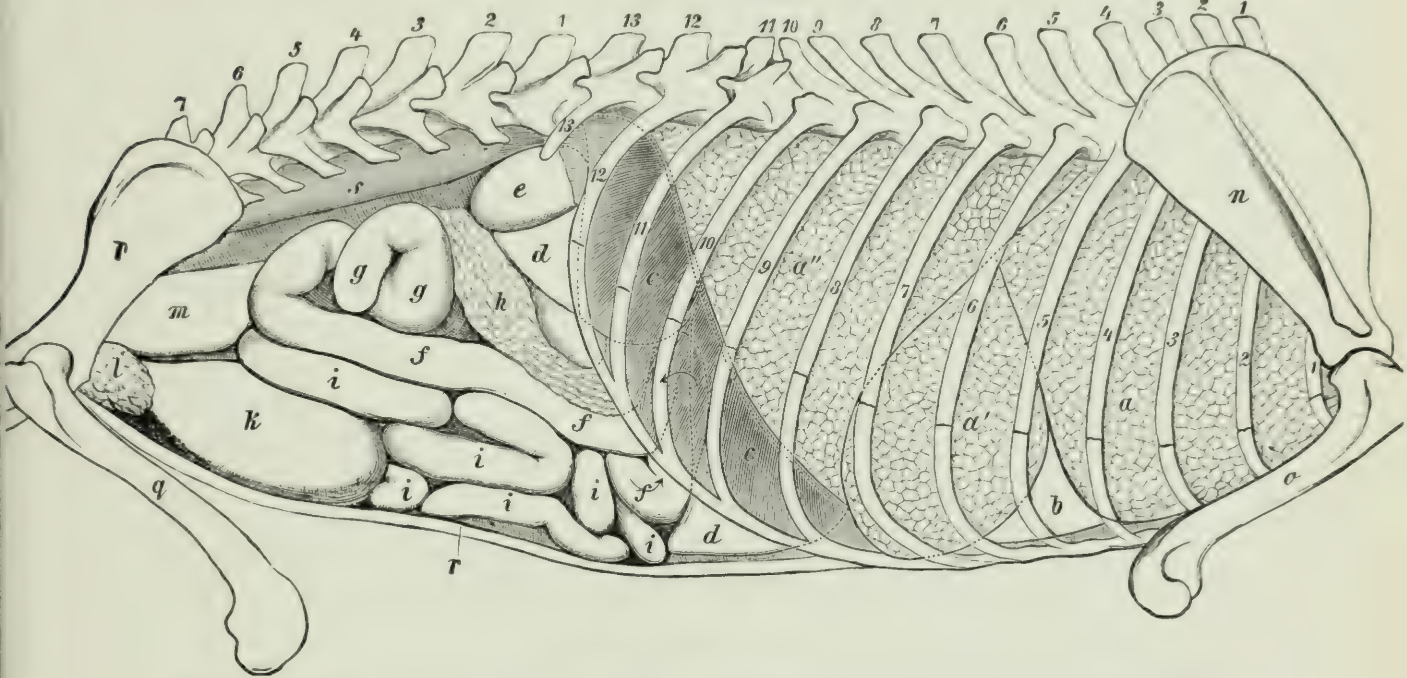


FIG. 72.—Right side of the thorax and abdomen: *a*, anterior lobe of the right lung; *a'*, heart-lobe; *a"*, right diaphragmatic lobe; *b*, heart; *c*, diaphragm; *d*, liver; *e*, right kidney; *f*, *g*, *i*, *m*, intestines; *h*, pancreas; *k*, bladder; *l*, prostate.

of the surrounding structures and enlargement of the thyroid gland, or to determine emphysematous swellings in the region of the trachea, or swellings, enlargement of the thyroids of the regional lymphatic glands.

Condition of the Lungs

The lungs of the dog consist of a number of layer-like portions which are united by the bronchi and connective tissue; the anatomical positions of the lungs are shown in Figs. 72 and 73. The left lung is divided into two main portions or lobes, an anterior and a posterior; the former is again subdivided in two, the cardiac and the pointed lobes; this division is not very distinct in some cases. The section that divides the large lobes begins opposite the fourth and fifth, seldom the sixth, vertebræ and runs downward and backward as far as the sixth rib; the anterior lobe extends as far as the first rib, anteriorly and posteriorly to the sixth rib; the large posterior lobe extends back as far as the eleventh or twelfth vertebra, where it extends upward and lies between the vertebræ and the diaphragm. The left lung has a small incision near the heart, called the heart incision. The right lung is somewhat larger than the left, and extends as far back as the twelfth or thirteenth vertebra; it is divided into four lobes, three lateral and one middle lobe, the posterior lobe being considerably larger than the corresponding lobe of the left lung. The cardiac lobe lies upon the heart, almost surrounding that organ; the other lobes hold the same relation as they do in the

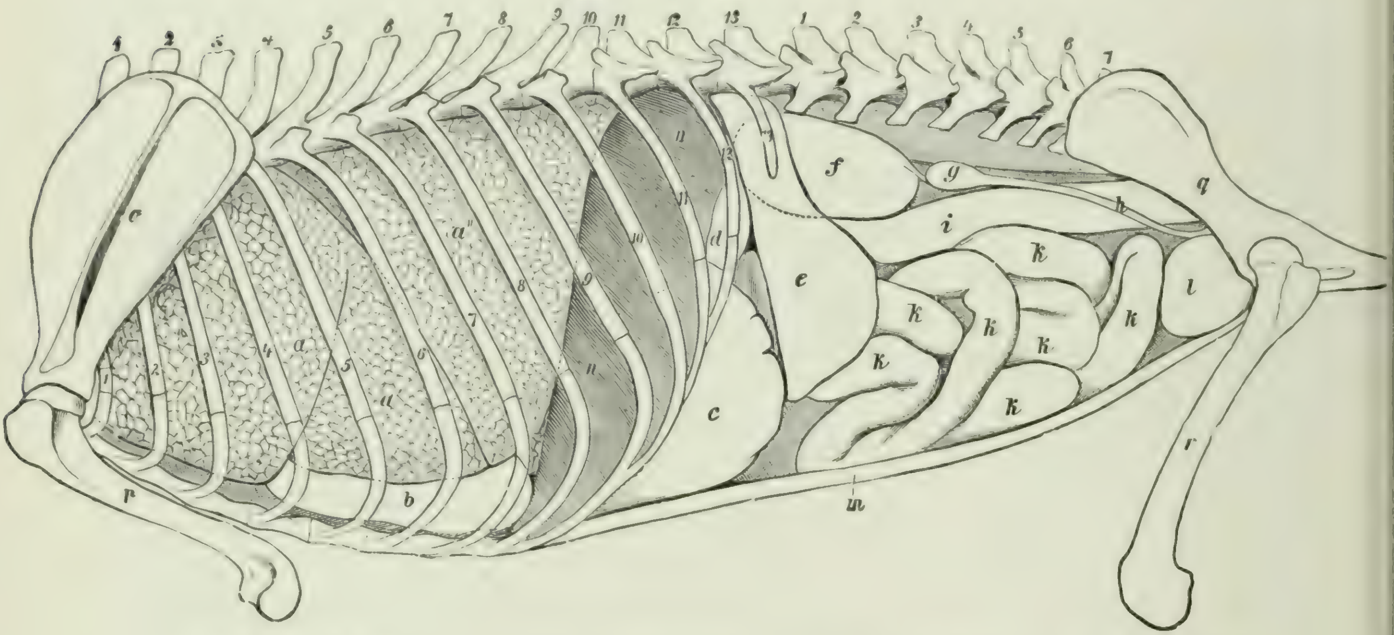


FIG. 73.--Left side of thorax and abdomen: *a*, left anterior lobe; *a′*, left heart-lobe; *a″*, left diaphragmatic lobe; *b*, heart; *c*, liver; *d*. stomach; *e*, spleen; *f*, left kidney; *g*, left ovary; *h*, left horn of the uterus; *i*, *k*, intestines; *l*, bladder; *n*, diaphragm.

left lung. The middle lobe of the lungs is a club-shaped portion, two lobed, that lies in a special groove in the mediastinum, extending anteriorly so far as the heart and posteriorly to the diaphragm (Ellenberger and Baum).

In making an examination of the lungs we must take into consideration the shape of the cavity of the chest, sensitiveness to pressure upon palpation of the chest, the number and character of the respiratory movements, the character of the cough, and the information derived from auscultation and percussion.

Shape of the Cavity of the Chest.—In healthy animals the two sides of the chest should be symmetrical; that is, if viewed from above the two halves of the thorax must appear equally arched. A depression or flattening on one side sometimes means pain in that portion of the chest, dry pleuritis, recent fractures of the ribs, one-sided contraction of the lung, as also after a rapid absorption of the exudate of pleurisy. A bilateral contraction or narrowing of the thoracic cavity behind the shoulders, usually accompanied by a boat-shaped spreading of the sternum (chicken breast) is often seen in dogs suffering from rachitis. In a case where there is a fractured rib there may be a protrusion in one place, an inflammatory condition of the ribs, and tumors, or hæmatomata of the wall of the chest; a one-sided arched or swollen appearance of the chest is especially present in case of severe unilateral, pleuritic exudate and in unilateral pneumo and hæmato-thorax. When the whole chest seems swollen, it indicates hydro-thorax, double pleuritis, with a great amount of exudate and severe emphysema of the lungs present; when only the posterior half of the thorax seems distended and we find the abdomen enlarged, it indicates ascites, tumors, or collections in the abdominal cavity. An œdematous swelling of the lower thoracic region sometimes appears during exudation pleuritis but is also present in conjunction with other symptoms in generalized dropsy.

Sensitiveness to Pressure.—This is produced by a number of inflammatory conditions of the skin and subcutis, the ribs, or the intercostal muscles as in cases of muscular rheumatism, or in fracture of the ribs, and quite frequently in the early stages of pleuritis; in this case there is pain on pressure between the intercostal spaces, and especially wherever sounds of rubbing are heard upon auscultation, and there may be great pain shown when there is no exudate; this is a very common symptom. For further information see page 223.

Number and Character of the Respiratory Movements.—Normal breathing is performed in the dog, as in other animals, through muscular action in inspiring, and the elasticity of the tissue of the lungs and the walls of the chest in expiration; this is also aided by the pressure of the intestines on the diaphragm. It is only when the respiration is obstructed that the assistance of the muscles of respiration is required in expiration. The works on physiology give more minute details on this subject. The normal respirations are from twelve to twenty-eight per minute, the size and age of the animal making a slight difference, in the smaller and young dog, of course, being more frequent. Various conditions tend to alter the above number, such as running, physical excitement, atmospheric temperature, fear, strange environment, lying on the side, the presence of a stranger, particularly if they handle the animal, overloading of the stomach, and advanced pregnancy. The conditions just named tend to cause an increase in respiratory movements. While the respirations in the dog are regular, yet they are disturbed more quickly by physical excitement than in any other animal, and after any unusual exercise, the dog will open the mouth. Irregularity in respirations in the dog may also be caused by dreams. Whenever in great need of air, e. g., during and after violent exercise, during great heat, when hitched to a wagon, etc., dogs are apt to pant, that is, to breathe with mouth open and tongue hanging out, and the number of respirations can easily be increased to 18-120 per minute. (See Ill. 75.)

A pathological lessening of the number of the respirations, may be seen in all serious affections of the brain and its membranes, in acute infectious diseases, such as septicæmia and distemper, in cases of poisoning by certain narcotics and in the agony and in cases of contraction of the air-passages.

A slight increase in the respirations without any actual laborious respiration being present, may follow any increase of temperature; they are also increased, when any pain is present, in certain diseases of the blood, some infectious diseases, generalized anæmia, etc.; in circumscribed pleuritis, in the commencement of peritonitis, in fractures of the ribs, and in rheumatism or inflammatory diseases of the muscles of the thorax, and of the intercostals. Laborious respiration (difficulty in breathing, dyspnœa) is seen particularly in all severe diseases of the nose (catarrh, tumors, etc.) and the breathing is generally rattly and wheezing and grows easier when the patient breathes through the mouth. Laborious respiration also appears (and often normal or even less rapid) where there is any contraction of the pharynx, larynx, or windpipe; for instance, from the swelling and inflammation of the mucous membrane in those organs, foreign bodies, tumors, also in bronchitis, pneumonia of all kinds, exudative pleuritis, hydro-thorax, pneumo-thorax, hæmato-thorax, pulmonary tuberculosis, pulmonary or thoracic tumors, emphysema of the lungs, etc. We see laborious breathing, with great increase of the number of respirations, in any irritation of the bronchial tubes, where they become contracted or filled with mucus, and in all diseases of the true lung-tissue, in all exudates into the pleural cavity, or in diseases of the abdomen, where there are collections of solids or fluids in the abdominal cavity that press on the diaphragm, e. g., formation of gas in the stomach and intestine, abdominal dropsy, large tumors, especially of the liver, etc., in cramp or spasm of the muscles of respiration, as in strychnia poisoning, tetanus, or eclampsia in nursing bitches, and as a result of many intoxications, also in diseases of the heart where there is stagnation of the thoracic circulation. In all cases of dyspnœa in the dog the animal rarely lies down, but prefers to assume a sitting position with the front legs spread wide apart. Extremely laborious respiration occurs in congestion of the lungs or in active hyperæmia of the lungs, which are often seen in the summer in dogs that work hard (draft dogs, hunting dogs, etc.), and also in œdema of the lungs. Difficult breathing usually occurs with open mouth but if not then almost always with blowing of the cheeks ("labial breathing") when the cheeks are distended with every expiration and

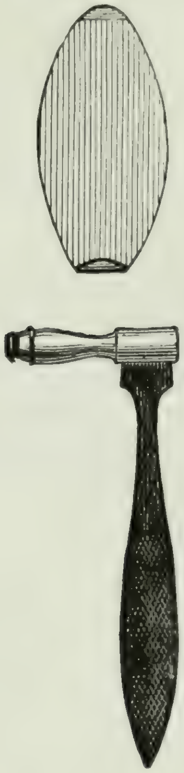


FIG. 74.—Pleximeter.

to the utmost in congestion of the lungs, just mentioned, and the wings of the nose are spread wide apart.

The type of breathing of the dog, as with all other domestic animals, is costo-abdominal because of the participation of both the pectoral and abdominal muscles in his respiration. A more costal type, in which the functioning of the chest predominates, is seen in cases of acute inflammatory diseases of the diaphragm or of its surroundings, in painful diseases of the diaphragm (peritonitis) or of any abdominal organs, furthermore in case of severe hydrops ascites, bloated stomach, large tumors in the abdominal cavity and in case of many lung diseases. The abdominal type of breathing, in which the movements of the abdominal wall are very marked, is seen first of all in the beginning stages of pleuritis, and then also in other painful conditions of the thoracic wall.

Cough.—The nature and form of cough are very important symptoms in all diseases of the respiratory organs. Cough is produced by reflex action from all parts of the mucous membranes of the pharynx, windpipe, bronchi, and also by an inflamed pleura. The pulmonary tissue never produces cough by reflex irritation. The so-called "stomach cough" is only imaginary; no such thing can truly be said to exist. The great resemblance that often exists between a spasmodic cough and a vomiting movement may also cause many people to consider the mucous membrane of the throat as suited to engender a cough. In spite of diseased respiratory organs or in spite of the use of artificial irritation

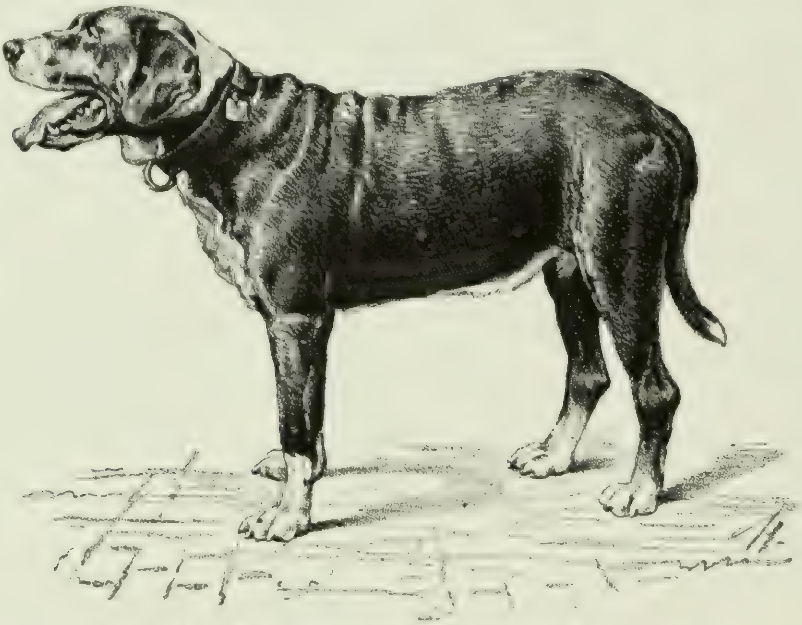


FIG. 75.—Dog panting after violent exertion.

a cough is generally absent in diseases of the brain or in certain cases of extreme weakness, and just before death from poisoning, as well as in cases where the glottis and the muscles of respiration are acutely inflamed. Where the sensitive ends of the vagus and particularly the supra-laryngeal nerves become paralyzed it is impossible to produce coughing by manipulation of the throat. Dogs do not cough intentionally, but there is no doubt that if it is very painful they can suppress it.

An animal may be made to cough by pressing the sides of the pharynx or trachea together between both fingers; if the throat is pressed hard an animal will cough once as a rule, at the most two or three times, and usually make sounds very similar to those of vomiting. Healthy dogs can usually be made to cough in this way.

Occasionally an animal is found that the most severe pressure of the larynx will not produce any signs of coughing, although it may make a swallowing movement.

Several spells of coughing, after a slight pressure of the pharynx, point to a diseased condition of that organ; if the same pressure is made on the windpipe, and the animal coughs violently, it also indicates a diseased condition of those parts. In bronchitis and catarrhal pneumonia, coughing can be produced by tapping on the wall of the chest, indicating diseased conditions of the deeper air-passages, particularly bronchitis, bronchopneumonia or catarrhal pneumonia, but may also occur in pleuritis. Spells of coughing may be produced as a result of unusual exercise, running, jumping, excitement, or from going out into cold air, etc., whenever a severe diseased condition that irritates to coughing is present. It also happens often that a patient suffering merely from catarrh of the pharynx or trachea, responds with a cough when the thoracic wall is percussed. The larynx and trachea are sensitive to pressure in palpation in case of acute laryngitis or tracheitis, and occasionally a slight whirring or trembling (fremitus laryngealis and trachealis) can be detected. In cases of laryngeal afflictions the cough is usually loud but either short, hoarse, rough, barking, croaking or, as in the loose stage of a catarrh, it is loose, moist, rattling and similarly, even though usually not so loud, in catarrhs of the trachea.

In the beginning of acute bronchitis and in pleurisy the cough is dull, weak, usually frequent, dry, and husky. In chronic emphysema, bronchitis, catarrhal or croupous pneumonia the cough is soft and generally less frequent. The cough in emphysema and œdema is very much the same, but not very frequent, and in certain forms of tuberculosis it is hollow and dull. Furthermore the cough is weak and feeble in catarrh of the pharynx and trachea when animals are very ill or greatly weakened with exceptions of course occurring. There are many exceptions to this rule; for instance, in cases where foreign bodies enter the lung through the mouth or following vomiting, the cough is convulsive and violent, resembling whooping-cough (chronic pharyngeal catarrh) in its intensity. As a rule dogs, suffering from catarrh of the respiratory tract, cough more frequently and more violently at night than during the day.

The expectorations cannot be examined in the dog as in many, as the animal generally swallows all the secretions; in rare instances there may be a small portion of the mucus thrown out of the mouth or nose in coughing. We can often see the animal chewing or swallowing after a fit of coughing, which indicates that the animal has brought up a piece of mucus into the mouth or pharynx; this is seen when the cough becomes loose, moist, or rattling, and is what is termed "looseness" of the cough, being seen generally in pharyngeal, tracheal, and bronchial catarrh. The largest amount of excretion is seen in bronchial and tubercular diseases, while in catarrhal and croupous pneumonia, and also in certain forms of bronchitis, we find the excretion is thick and firm and often first accompanied by dry, laborious coughing spells, before ending in one or two loose coughing spells and at the end of the cough there is a swallowing movement. In hemorrhage of the lungs the cough is accompanied by more or less foamy blood from the nostrils and mouth and in some cases symptoms of choking; a slight hemorrhage may escape our observation, as generally all the blood is swallowed. Under such

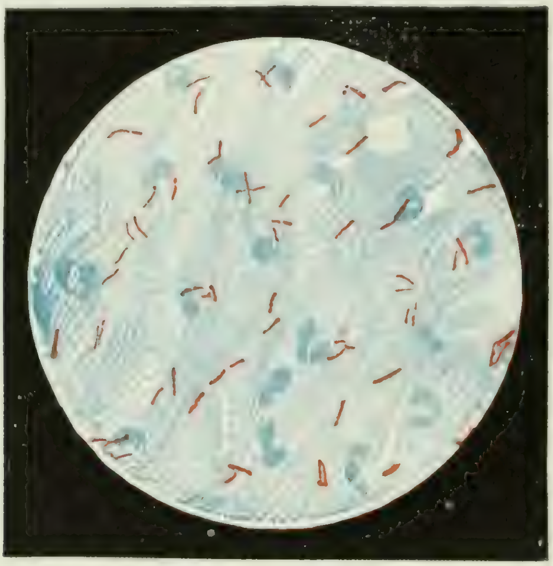


FIG. 76.—Streak preparation of sputum with numerous tubercular bacilli. Colored by Ziehl-Nelson.

conditions the foamy blood from the nostrils may be absent. By examining the oval cavity it is possible to diagnose doubtful cases.

ining the oral cavity it is possible to diagnose doubtful cases.

If tuberculosis is suspected it is advisable to make a microscopic examination of the excretion for tuberculosis bacilli. The best time to take the excretion from the pharynx is immediately after a coughing attack.

The mouth is opened immediately after a natural or forced coughing spell, or is held open by an assistant, the tongue is held down or pulled forward and the excretion located just in front of the larynx is wiped off with a cotton swab or sponge fastened to a stick or pinceps. After first opening the mouth a cough may be forced by irritation, but in that case, even more than in the method first described, it is necessary to protect oneself against infection by tying a cloth over one's mouth and nose. It is also possible that several attempts may be necessary before securing the desired result; furthermore not finding tuberculosis bacilli in the excretion does not prove that the dog examined is not suffering from tuberculosis.

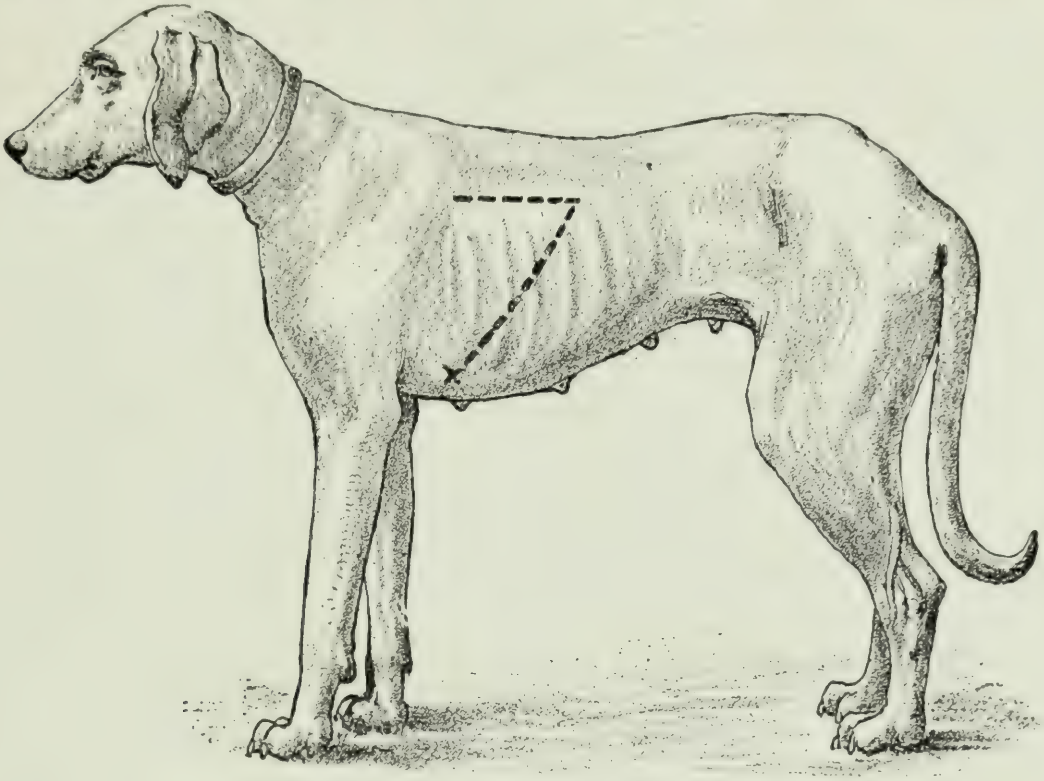


FIG. 77.—Field of percussion; x, location of heart beat.

Demonstrating the presence of tuberculosis bacilli is usually done according to the Ziehl-Gabbet method: The air-dried cover-glass preparation is covered with Ziehl's solution of carbol-fuchsin (1 fuchsin, 10 absolute alcohol, 5 carbolic acid, 95 distilled water) and warmed several times over a flame for two minutes. After this the cover glass is placed down for several minutes, then rinsed with distilled water and then covered with Gabbet's solution (2 methylene blue, 100 25-per cent sulphuric acid). After 1-2 minutes it is rinsed with water and examined. The tuberculosis bacilli are colored red, the other constituents of the preparation blue. An oil immersion lens system is preferable for examination even though in case of necessity a strong dry lens system will suffice. In practice it will hardly ever be necessary to examine the broncho-tracheal excretion of the dog for still other constituents.

Percussion of the Thorax.—Percussion (tapping) of the thorax is performed, whenever possible with the animal in a standing posture, by means of a percussion hammer and an ivory or metal plate (pleximeter) (Fig. 74). Lay the plate close to the wall of the chest, and, with the hammer in the other hand, strike the place a number of light, quick taps; the fingers can also be used for percussion, and are preferred by some. Place the index or middle finger of the left hand firmly on the chest wall, and with the index or middle finger of the right hand, bent at the tip, tap on the finger of the left hand. When the field of percussion is too small to allow the plate to be placed upon it, then the "hammer-finger-percussion" is advocated. With this method the percussion hammer is used but the index or middle finger of the left hand is used instead of the plate. In general the finger percussion is given preference at least with smaller dogs.

The limits of percussion are given in Fig. 77, but it must be taken into consideration that on expiration the posterior limit of the lungs is carried forward of the dotted line and not extending to the last rib and also that when the stomach or intestines are very much filled with gas, and crowd the diaphragm forward, the extent of the lungs is lessened. Under ordinary conditions the percussion area (as far as the lungs are concerned) lies in a triangular space between the lower side of the muscles of the back, the posterior portion of the muscles of the forearm, and the ends of the ribs. From this area the region of the dull cardiac areas must be deducted from the left and the right. By pulling the forelegs forward and sideways, the extent of the field of percussion of the chest wall can be increased for examination. In percussion we make the distinction between a clear, loud, normal lung sound, a subdued sound in its varying degrees ranging from a relatively to an absolutely subdued (dull, empty) sound, and a typmpanitic dull, or solid sound of a diseased lung. Furthermore a distinction is made between the tone or sound of a cracked vessel and the percussion sound with a metallic ring. The clear normal sound of the healthy lung is heard all over the thorax, the volume of sound depending on the thickness of the thoracic wall at the particular part being examined. The muscular layers of the chest, accumulation of fat and heavier bones have a certain effect on the sound, very thick walls lessening the sound to a certain extent; in spite of healthy lungs the sound is more or less dull over the shoulder-blade, sternum, and back, and over all other regions of the thoracic wall in case of very fat dogs; the posterior borders of the lungs and the region of the cardiac notch also present normally very subdued sounds, as they are so thin. An abnormally loud (overloud, overfull) sound is heard under normal conditions in dogs with a very thin thoracic wall (very young, greatly emaciated or very small animals) as a pathological occurrence under certain conditions as in case of pulmonary emphysema, sometimes probably in pneumo-thorax (see later: tympanitic sound).

A dull, muffled sound, which has been mentioned in the above classification, is heard in the following conditions: In the tissues of the lung, where the air cannot reach, as in hepatization; in croupous pneumonia; in tuberculosis, provided that the diseased center is not too small or entirely surrounded with or distributed through tissue containing air; in tumors of the lungs; in hemorrhagic infarction in sections of the lungs that are compressed by pleuritic or pericardial effusions. (Edema of the lung usually results in no change at all in the percussion sound or if there is any change it will be only a slight subduing, but sometimes there may also be a tympanitic sound.

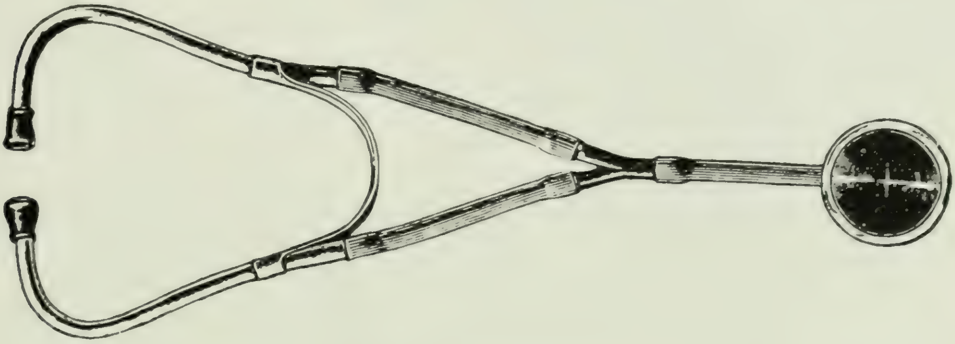
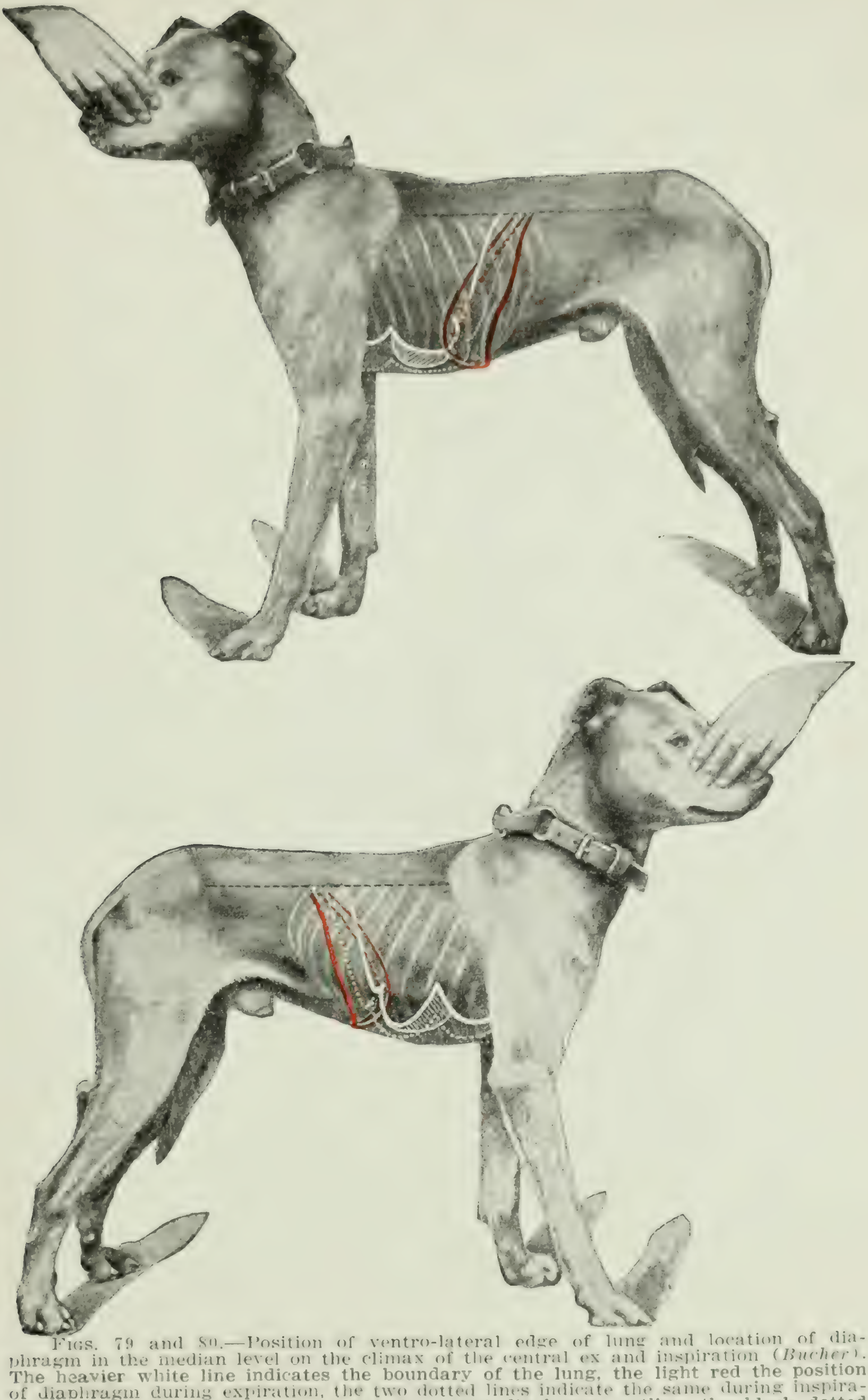


FIG. 78.—Stethoscope.

The dull sound is present, when a dulling or subduing medium is between the lungs and the thoracic wall, as in the various pleural diseases; tumors of the pleura; pleuritic or dropsical effusions (horizontal dulling, also in case of change of position of the animal); and also in certain pathological alterations of the walls of the chest, as in œdema, or tumors, phlegmon, etc., which have caused a thickening of the walls. The more the tissues fill up near the walls of the chest or the greater the density of the medium between the pleximeter and the lungs, the more indistinct and muffled the sound becomes.

The tympanitic sound is heard where there is any cavity or hollow in the lungs, as in pneumothorax and in large bronchial dilatations. In the alteration of the tension of the parenchyma of the lungs, furthermore in the beginning and loosening stages of pneumonia the tympanitic sound is heard more or less distinctly and occasionally we find the sound above pleuritic exudates and in the neighborhood of large tumors of the lungs, or in compression of the lungs from the pushing forward of the diaphragm due to tumors, or ascites. It is also heard in moistening of the alveoli by fluids and reduction of the contained air, as in the loose moist stage of croupous pneumonia; and where there are many small tubercular centers, in the tissue of the lungs, which are hollow in the center and contain air, and it is sometimes heard in œdema of the lungs. A tympanitic sound can also be heard with percussion in case of a ruptured diaphragm with a prolapse of either the stomach or an intestinal loop containing air into the thoracic cavity. Subcutaneous emphysema of the walls of the chest gives a clear tympanitic sound. There are several modifications of this sound, such as the cracked-pot (tinkling) which is occasionally heard in bronchopneumonia and above a pleuritic effusion as well as over large cavities in the lungs and in pneumothorax; or metallic, tinkling percussion sound, which may appear above large cavities of the lungs and in pneumothorax; but these are not of much diagnostic value, as they appear only when there may be large cavernous spaces in the walls of the chest.

Auscultation of the Lungs.—This is performed with the animal standing or lying, either by putting the ear directly against the walls of the chest, over the affected region (direct auscultation), or by using a stethoscope (Fig. 78) (indirect auscultation). (A form of stethoscope called the "Phonendoscope" (Fig. 81), a modification of the phonograph, has lately been introduced and used in the larger animals with considerable success, but the person using it must be thoroughly familiar with the chest sounds and also with the instrument to get the best results, but the writer finds that on account of its size it is not of much practical use in the dog.) The first method is the best, especially with restless animals, and will suffice under ordinary conditions. It is always expedient to fasten a cloth (towel, handkerchief) around the chest of the animal that is being examined in order to avoid direct con-



Figs. 79 and 80.—Position of ventro-lateral edge of lung and location of diaphragm in the median level on the climax of the central ex and inspiration (*Bucher*). The heavier white line indicates the boundary of the lung, the light red the position of diaphragm during expiration, the two dotted lines indicate the same during inspiration. The heavier red line indicates the costal diaphragm outline, the black dotted the dorsal boundary of the side costal wall. The section of heart not covered by the lung is striped in white.

tact with its skin. On the other hand the stethoscope is almost invaluable in all cases of determining or judging more accurately very weak sounds, especially sounds restricted to small areas.

In order to avoid otitis it is advisable to first thoroughly cleanse the tubes that are to be inserted into the ears or to envelope them with a thin layer of cotton. The mouths of biting dogs should be closed if possible during auscultation; in case of long-haired dogs the "crackling" of the hair can be avoided by moistening or oiling the hair; by producing irritation that will cause a cough the doubtful cases can be better diagnosed by the respiratory sounds thus being increased and, under certain conditions, by inducing the appearance of new sounds.

The ear distinguishes the true respiratory sounds and the accessory sounds. In the former we hear a vesicular respiratory bruit, which has a lapping character, and the bronchial respiratory bruit, which is a blowing murmur, and, lastly, an indistinct respiratory bruit, which has neither a pronounced sucking character nor a pronounced blowing character. The vesicular respiratory bruit (vesicular respiration, alveolar murmur) is heard wherever any portion of the lung that is filled with air lies against the wall of the chest. Normally the sound is a smooth, regular murmur, only audible in inspiration (vesicular inspiratory murmur compared with vesicular expiratory murmur discussed later) and proves the air going directly into the alveoli without any resistance. Its intensity varies greatly even in healthy dogs. This sound can be increased very much even during health by active movements or during excitement; it is also much clearer and louder in emaciated animals—in dogs whose chest walls are thin and flat. The vesicular murmur is always much louder in young animals, and especially in puppies; the murmur is also noted in expiration in animals under nine months. It is essentially weaker in fat dogs or very muscular dogs, as well as in animals with very arched ribs. According to the

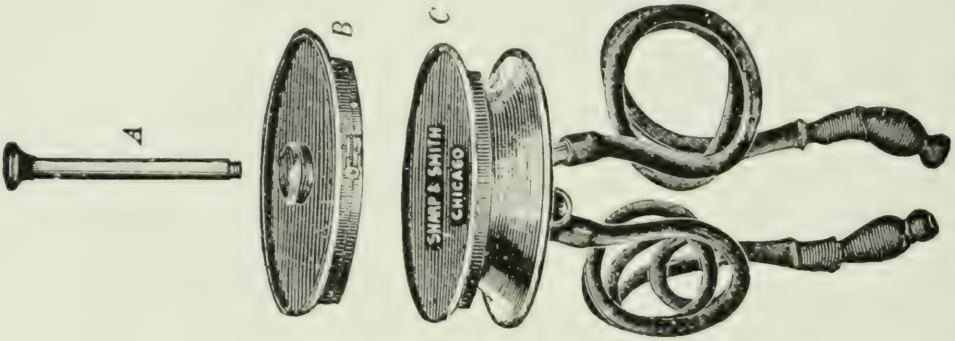


Fig. 81. Bianchi-Bazzis phonendoscope.

amount of irritation, the vesicular murmur is lessened in bronchial catarrh where there is much swelling of the mucous membrane and secretions collected, in stenosis of the upper air-passages, in emphysema of the lungs, in certain stages of catarrhal pneumonia, in pleuritic or dropsical exudations, in thickening of the pleura from the deposit of lymph-masses, tumors or œdema.

It disappears entirely in croupous pleuritic effusions, in pneumothorax, and in complete closure of one of the large bronchial tubes, and in complete obstruction of parts of the lungs caused by pneumonia, intra-pulmonary tumors, etc.

The vesicular murmur is increased in dyspnæa in portions of the lungs that are healthy when other parts are diseased, the healthy portions doing all of the work; this is especially seen in bronchitis, where the smaller bronchi are plugged up with secretions; also when certain sections of the lungs function vicariously for others that have been put out of use. Deceptions are possible because accessory sounds, which come from the upper air passages (larynx, trachea, etc.), intermingle with the vesicular respiratory sounds. We occasionally find an irregular spasmodic, jerking or interrupted vesicular murmur in healthy, especially frightened or excited dogs, but it is sometimes also heard in cases of bronchitis.

The murmur of expiration is very slight; in normal cases it can sometimes hardly be heard; it is quite plain when the breathing is strong after excitement, action, etc., especially in young dogs and those animals that have a thin chest wall, and then almost resembles the vesicular inspiratory sound. The sound is strengthened, sharpened in tone, and prolonged; pathologically (often sounding almost bronchial) in bronchitis.

The bronchial respiratory bruit (bronchial breathing, wheezing sound) may be heard in the normal respiration of the pharynx, windpipe, and the anterior part of the chest in diseased conditions; it appears where any part of the lung is deprived of air, and the disease has plugged up the smaller bronchi and extended to the larger-sized bronchi. This is the case in the various pulmonary affections, where we find large sections of the lungs are obstructed, or in compression of the lung by a pleuritic exudate or by tumors, or by dropsical transudates, and in rare cases by the pressure of the diaphragm where it is pushed forward from the collections of fluids in the abdomen. It is also heard when a quantity of mucus is coming up the bronchial tubes; this sound disappears when the mucus is coughed up. Lastly, we find it in cases where the lung has large cavernous spaces in it, and—as an accessory murmur—in case of severe stenosis of anterior air passages (nose, larynx, trachea, larger bronchial tubes).

Indistinct or intermingled (confused) respiratory bruits, transitional, indicatively or indefinitely bronchial or vesicular breathing is heard, for example in lobular pneumonia, lobular-pneumonic centers, where numerous diseased lobules and located close together among clear tissue that the air is passing into, and where the true character of the respiratory bruit is not heard on account of the loud rattling of the air going through the contracted bronchial tubes. Indistinct respiratory sounds are also heard where there is more or less mucus in the bronchial tubes, and after the animal has had a coughing spell the true bronchial sound is heard again; furthermore in case of moderate compression of the lung, or when the passage of air into the alveoli is temporarily checked as the result of secretions obstructing the bronchials.

Irregular bronchial sounds (rattling bruits) are caused by the movement of the mucus or fluids that are in the air-passages, being carried to and fro by the passage of air. They are dry (snoring, wheezing) where a small quantity of very tough sticky mucus collects in the bronchial tubes, as is seen in some catarrhal affections and in cases where the bronchial mucous membrane is considerably swollen. The snoring sound is generally heard in the large bronchial tubes. The wheezing sounds occur in the smaller bronchial tubes. A spell of coughing produces considerable change in the character (quantity and quality) of the slight, rattling sounds of the chest. The rattling sounds are moist when the secretions are liquid; the thicker they are the duller the bruits become. We hear moist, rattling sounds when the thin secretions are collected in the large bronchi; this sound is also heard when there are cavernous portions in the lungs. We find much less when this is the case in the middle bronchi, and a very low bronchial bruit when the small bronchi are involved. By this means we can distinguish in what position the irritation lies in the bronchi; this is rather important in diagnosing a case of bronchitis. When the fine bronchioles are involved it has a crackling or crepitant sound and sibilant bruits; these are, with rare exceptions, only heard during inspiration. This sound may sometimes be heard in the alveolar passages and in the alveoli themselves, when they are filled with mucus or closed up, and where the air can reach them only by strong inspiration. This is seen in the first and third stages of croupous pneumonia, often in catarrhal pneumonia, and with peculiar hard tones in interstitial emphysema of the lungs, in œdema of the lungs and in capillary bronchitis; in the last the crepitation is mixed with an irregular rattling sound. We find also the friction sound of the pleura; this is not heard in the normal condition, but in disease, it is either crepitating, scraping, or scratching. It is heard in pleurisy; as a rule it is louder on inspiration than expiration. This sound is produced by collections of fibrinous accumulations on the pleura. These sounds are not heard when the pleura is separated by an exudate. The sound is plainest at the commencement of the disease, and when the exudate is being absorbed. This sound is not altered to any great extent by coughing, and in this way can be distinguished from rattling sounds which may occur in conjunction with the rubbing sounds that are heard when it is a case of pleuro-pneumonia. The rubbing sound caused by the broken ends of a fractured rib is indicated by the crepitation on movement of the ends of the rib. Deception may also result from the crackling of the hair underneath the stethoscope as mentioned previously, if the ear or stethoscope is not placed firmly enough against the wall of the chest. The rubbing sound of the pleura is noticed not only in pleuritis sicca (dry) and pleuritis exsudativa (exudative—moist), but also in the beginning stages of tuberculosis of the pleura and in pleuropneumonia.

Puncturing the thoracic cavity: This may be of great diagnostic value in all cases that demand definite knowledge of the presence of fluid in the thoracic cavity or fuller information concerning the exact nature of a fluid effusion. The usual method is to use a large-sized Pravaz syringe. The hollow needle of the syringe is inserted, with aseptic precautions, into the dog (the animal may be standing or sitting) at a place that involves no danger. This may be on the right side along the upper margin of the lower third portion of the sixth intercostal space or of the seventh intercostal space on the left side. The caudal margin of the ribs should be avoided because the arteria intercostalis may sometimes protrude slightly from the bony edge. It is important to note, with regard to judging the fluid secured by the puncture, that the transudates caused by obstruction generally are clear or faintly opalescent, colorless or colored faintly red, that after standing for some time they either do not coagulate at all or very little and always have a low specific gravity and a low albumen content; on the other hand the exudates resulting from inflammatory processes, as in pleuritis, are characterized by a decided cloudy appearance, high specific gravity and high albumen content. Generally the classification of cavernous exudates into serofibrinous, hæmorrhagic and purulent specify or indicate their other properties. The bacteriological examination is of special importance here as for example, for tuberculosis bacilli in serofibrinous pleuritis which often is of tubercular origin.

DISEASES OF THE NASAL CAVITIES

Catarrh of the Nose

(Cold in the Head; Coryza; Rhinitis; Nasal Catarrh)

Etiology.—Catarrh of the nose (catarrhal inflammation of the nasal mucous membranes) occurs very frequently and originates from local causes (dust, smoke, pentastomum tænioides, foreign bodies) or by cold. Coryza is also a symptom of distemper, and may appear secondarily in any inflammation of the other mucous membranes of the head. Where a large number of dogs are kept together, it may occur as an epizoötic and is then no doubt spread by contagion, or may result from being bathed in cold weather and not being properly dried, clipping or shaving the hair, sudden change in temperature, or from ulceration of the nasal passages. It also accompanies tumors, parasites, ulcerous or other pathological processes in the nasal cavity especially when it develops into a chronic inflammatory condition. In more serious diseased conditions the mucosa of the accessory cavities (sinuses) becomes involved sympathetically.

Clinical Symptoms and Course.—These are sneezing, wiping the nose with the paws, or rubbing it against some object. Later a nasal discharge, which is watery and liquid at first and later becomes more copious, turbid, thicker, and more tenacious; and it may become purulent, according to the complications that may appear later on. If the cavities in the upper chamber of the nose are affected, the discharge is very profuse and there is more or less disturbance of the general system. When the catarrh is confined to the anterior chambers the nasal cavities are often very much contracted and we hear a snuffling nasal bruit; and if the chamber is very much contracted we may see dyspnœa, and the animal is then compelled to breathe through the mouth. This is apt to occur more in those dogs that have narrow, twisted, or curved nasal chambers, as in the case of the pug and bull dog. True bleeding of the nose (epistaxis), or mucus streaked with blood, is very seldom seen, at least in cases of simple acute nasal catarrh. The duration of such a case of nasal catarrh is usually short, generally only a few days; although we may occasionally see a case where there is a tendency to a chronic condition, especially in dogs with short heads, as Boston Terriers, pugs, bull dogs; in such a case the secretion becomes tough, sticky, glassy or even purulent and has a tendency to dry around the nose, forming a dirty crust around the nostrils and the upper lip, causing the skin of that region to become inflamed (see later under Pentastomum tænioides). In such cases the mucous membrane is dry, corrugated and frequently gray in color, the breath may remain fœtid, resisting all palliative treatment, and may continue this appearance as a chronic condition for a long time even after overcoming the nasal catarrh and may sometimes affect the animal all through life. The sense of smell may also be affected more or less. In very bad cases the secretion is purulent, with a very bad odor, and in rare instances streaked with blood. This is specially the case where the pentastomum tænioides is the cause of the diseased condition of the mucous membrane.

Therapeutics.—A simple nasal catarrh will generally disappear after several days without any special treatment. To protect the neighboring tissue from the excoriation of the tissues caused by the discharge it is well to keep it clean with tepid water and a little borax, or to coat the part with vaseline or oxide of zinc ointment. In all mucous, purulent, or chronic catarrhs spray the nose with a 2 per cent solution of creolin, or coat around the nostril with vaseline or oil. In acute catarrh it is best to spray the nostril with an atomizer, using either of the following solutions: Creolin, 0.5-1 per cent; carbolic acid, 2 per cent; common salt (sodium chloride), soda, ammonium chloride, 1; boric acid, 3 per cent; tannic acid, 1-2 per cent, or (in case of a lack of an inhalation-apparatus), the inhalation can be given in the form of warm solutions, allowing the animal to inhale the steam from them by the method described in the treatment of chronic catarrh of the larynx on page 136, or with an atomizer; infusion of chamomile, wild caraway or peppermint, creolin water, carbolated water, tar water, and water to which has been added juniper oil, templin oil, formalin solution, aqueous ammonia or oil or turpentine have been used with good results. Fœtid discharges from the nasal cavity may be treated by injections, irrigations, or local applications but, as a rule, animals resist treatment, and the excitement and irritation to the animal does much more harm than good. The vapor apparatus described on page 136 is much simpler and produces good results. Painting the nasal cavity with a 1 to 15 per cent solution of cocaine, or 1:100 of solution of "acoin," will anæsthetize the mucous membrane and lessen the irritation of the animal; an atomizer may be used or powder applied by means of an insufflator is useful to make local applications to the nose; in making such manipulations care must be taken to have the patient's head dependent and use very little force in the application, so the injection may traverse only the nasal cavity and not be driven into the larynx and into the lungs. For the nasal irrigation a soft canule punctured on the sides and connected with a rubber tube and funnel is used. The mild albuminous solutions of silver may also be used. For local applications to be painted on the following are advised: Tannin glycerine (1:10), silver nitrate solution (0.5-1 per cent), and protargol-vaseline (1:20); for injections and irrigations boric water, creolin water, 1-2 per cent solutions of common salt, soda, ammonium chloride, alum and tannic acid and for the insufflation boric acid, menthol with boric acid (1:30), bismuthum subnitricum, zincum sozoiodolicum and itrol. No actual results could scarcely be expected from the internal administration of anticatarrhal drugs. More severe nosebleeding is to be treated as described in the following paragraph:

Other Diseases of the Nasal Cavities

Bleeding at the Nose (Rhinorrhagia)

This is a result of traumatic or mechanic causes, such as blows, bites, lacerations, or the entrance of foreign bodies into the nasal cavities; it also results from acute or chronic catarrh, ulcerations, pathological growths, parasites in the nasal cavity, congestion or rush of blood to the nasal region, head, from some infectious and constitutional diseases, parasites (pentastomes), or hemorrhage from the lungs. It also is seen as an almost never failing symptom of "Dochmiasis."

Violent bleeding at the nose can be controlled by injections of cold water or a 3 per cent. solution of chloride of iron into the nostril. It is very difficult to place a tampon in the dog's nose that will be efficient, on account of the anatomical peculiarities.

When the pentastomum is present, the only efficient way to get at it is to trephine the frontal bones, so that agents can be injected directly into the location of the parasites. For this operation refer to the text-books on surgery.

Treatment.—No treatment is generally required, as the majority of attacks of epistaxis stop spontaneously if the animal is kept quiet. In persistent cases, in addition to the removal of the causes, it is advisable to first of all make applications of cold or hot water to the head and bridge of the nose while solutions of equal parts of vinegar and alum are also injected into the nose, or injections of vinegar and water, equal parts, 3 to 5 per cent. solution of alum, tannin, chloride of iron or antipyrin (1:10), or iron vitriol, or a weak solution of suprarenin. As a rule the insufflation of styptic powders (tannic acid, alum or zincum sulfuricum, pure or mixed with amylieni (starch), antipyrin, ferripyrin) is less efficacious. Tampons are rather difficult to apply, but if the bleeding is persistent they can be used and should be resorted to when compresses and injections have failed, or ferripyrin, suprarenin (0.1%) or in oil of turpentine, taking care the plug is not pushed in entirely, so that it can be removed later by means of forceps. The best means of applying the tampon is to use the rapid tampon, the smallest size of which can easily be pushed through the nostril into the nose of large and medium sized dogs. It is very important in all cases of nose bleeding, particularly when there is an apparent cessation, to make sure by an inspection of the pharyngeal cavity that the blood is not flowing backwards through the posterior nares. False chewing and swallowing movements would also indicate this. In very severe cases of nose bleeding subcutaneous injections of suprarenin (adrenalin) are prescribed. The treatment of general anaemia which results can be found in the chapter on anæmia. The so-called internal styptics are useless. The injection of gelatine solution, once so much in vogue, is not now used, as it is dangerous. Anæmia from exposure and persistent epistaxis is considered in the chapter on that subject.

Tumors of the Nasal Cavities

Tumors occur comparatively seldom in the nose and nasal cavities. They have their origin partly in the mucous membrane and partly in the bony substructure. These tumors may be indicated by a swelling or alteration of the nostril or the adjacent structures; frequently osteosarcomas involve the nasal septum, palate or superior maxilla, the new growth absorbing or disturbing the normal anatomy of these structures and carcinomas converting the bones into soft cellular structures. Carcinoma, osteoma, fibrous and mucous polyps have, nevertheless, also been found. Polyps are sometimes present and are removed permanently either by tortion or by removing the nasal bone and getting into the nasal cavity. Sarcoma and carcinoma are usually incurable after they have reached the stage when they can be determined clinically.

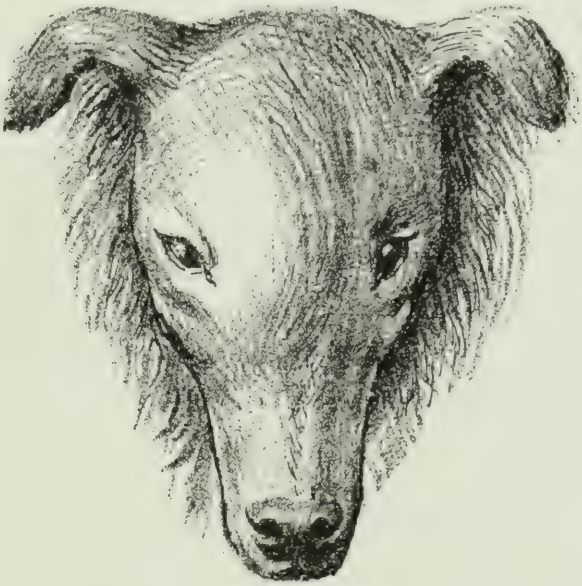


FIG. 82.—Dog with chronic catarrh and pus in the frontal sinuses.

Catarrh and Pus in the Frontal Sinuses

Catarrhal and purulent processes (*empyema*) in the adjoining cavities are seldom of importance unless located in the frontal sinuses. This may result from traumatisms or from pentastomes (see later) or new formations in the frontal sinuses, as a result of nasal catarrh, indicated by nasal discharge, swelling and dullness or percussion of the frontal sinuses (see Fig. 82). Acute catarrh of the frontal sinus that has resulted from a nasal catarrh generally disappears of its own accord when the primary ailment (nasal catarrh) ceases—may result as a sequel of influenza; as a rule, however, it is spontaneously absorbed. If it is chronic, the pus may be drained and if distention has developed the pus may be liberated by trephining, and the cavities washed out with astringent solutions, peroxide of hydrogen, zinc, lead, or alum.

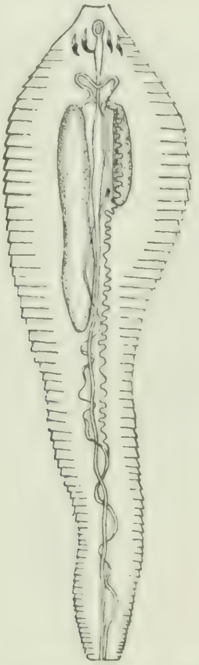


FIG. 83.—Pentastoma tænioides.

Pentastoma and Pentastoma Influenza (*Linguatula Tænioides*).—This tænia-like parasite, which belongs to the class of archnides, and order of Linguatulæ, has a flat, tongue-like tapering body, which is indented at its borders and composed of 90 to 100 segments, making the body have a saw-like appearance, and is whitish-yellow in color (see Fig. 83). The female is 80 to 95 mm. and the male 18 to 20 mm. long, both sexes about 1 to 2 mm. wide.

These parasites are found, sexually matured, in the sinuses of the forehead and the upper nasal chambers of the dog and wolf, seldom of other animals; they may also find their way into the pharynx, where they are developed sexually. The eggs are yellowish-brown, as many as 500,000 being found in one female. They escape from the female by means of the nasal mucus. Then these eggs are attached to some vegetable substance eaten with the vegetable food by a herbivorous animal or man. In the stomach the embryo enclosed in the egg becomes free when the shell is dissolved and reaches the liver and mesentery glands in various ways. It is found sometimes also in the spleen, kidneys, peritoneum and other organs, and in rare instances in the lungs, where it becomes encysted; and then undergoes several changes including shedding its skin several times—after which this is the sexless larval form, pentastomum denticulatum (*Linguatula denticulata*) (Fig. 85). It resembles the matured sexed parasite in general shape, except that it is much smaller, from 4 to 5 mm. long, and in its anterior part about 1.5 mm. wide. It lies in a detached cyst which is about 5 mm. long. In about six months it becomes sufficiently developed to break through the cyst-wall, and by direct migration finds its way to the lung and bronchial tubes; it is coughed up from the lungs of the host or gets into the free abdominal cavity, where under certain conditions a new encystment takes place. If at this stage the larva with organic parts of the host is eaten by a dog, it finds its way into the nasal cavities of the dog through the food either from the pharyngeal cavity while it is being devoured or by passing upward again from the stomach, or is carried into the nose in respiration and crawls up into the nasal cavities.

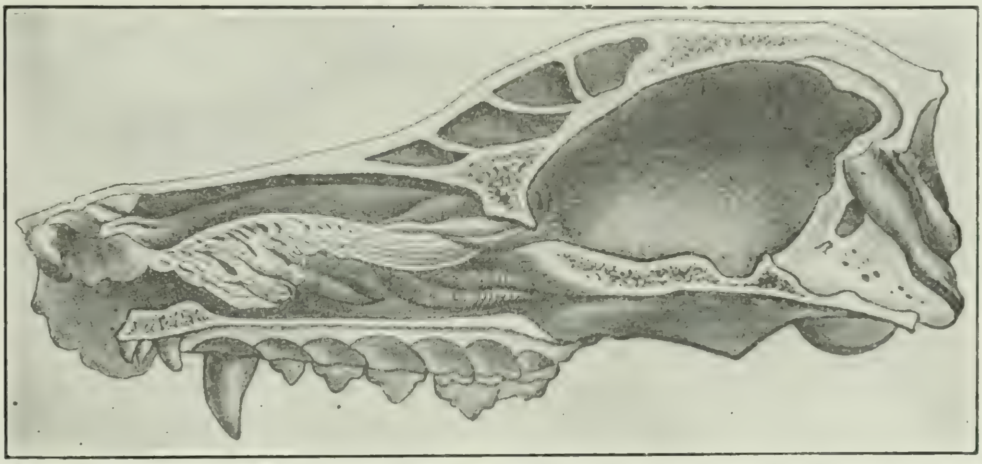


FIG. 84.—Cross-section of the head of a dog with pentastoma in the nasal cavity.

In 6-7 weeks the larvæ develop in the nasal cavity into sexually matured animals, i. e., into Pentastomum Tænioides. The female prefers to locate deep in the nasal passages, especially in the middle one, as well as between the cells of the ethmoid bone, less often in the frontal sinus, or in the tympanic cavity. The male is found in the various regions of the air cavities, occasionally in the pharyngeal cavity at the entrance of the larynx or in other places. In all places where the parasites occur, the mucous membrane is affected by catarrh, is covered profusely with mucus and is sometimes slightly streaked with blood. Only occasionally are severe changes found, as for example necrotic processes, especially in the cells of the ethmoid bone.

While the disease is rarely observed, numerous cases seem to occur in certain districts. The majority of observers consider the disease rather difficult to diagnose because the symptoms which appear are very insignificant or not at all apparent, and generally it is only when it involves a number of animals, such as a pack of hounds or carriers, or in one of the districts where it is prevalent, that it is noticed. It is also true that the pentastomum cold (*coryza*) seldom is actually identified or treated in clinics except in isolated cases although pentastomum tænioides is not at all a rare occurrence in operations. For example: in Alfort, 64 dogs out of 630 were infested with this parasite; in Toulouse 5 out of 60 dogs; in Berlin, 13 out of 200; in Chemnitz 3 out of 326. The larger breeds of dogs are most frequently affected and show the symptoms of chronic nasal catarrh.

Pentastomum catarrh differs from ordinary nasal catarrh, from the fact that in pentastomum catarrh there is a more or less bloody nasal discharge which is very purulent and putrid, and that the animal is greatly depressed. There is marked interference with respiration, the animal appearing at times to almost suffocate; the sense of smell is generally lost or is very slight; it becomes emaciated and sneezes a grat deal oftener than in ordinary catarrh. An instance is recorded where the parasite penetrated the hard palate, causing a great flow of saliva. In some cases the inflammation has extended from the nasal cavities to the cranial cavity and produced meningitis with severe cerebral symptoms, great excitement, restlessness, and a tendency to biting or snapping, and also paralysis of the lower jaw and several symptoms very similar to those of rabies.

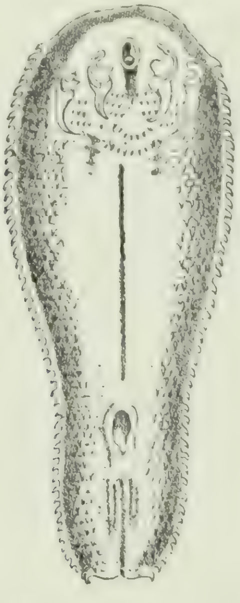


FIG. 86.—Egg of the pentastomum tænoides magnified 200 times.

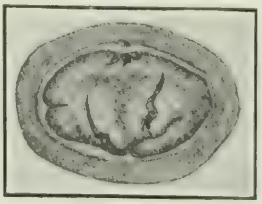


FIG. 85. — Pentastomum denticulatum.

Friedberger and Frohner advise that in all cases where there are symptoms of rabies, that the frontal sinuses be examined, as there are often cases where the pentastomum is present and it may produce cerebral symptoms, and even death, without any marked alteration in the mucous membranes of the nasal passages. Usually, however, the disease gradually disappears of its own accord as the parasites are probably discharged. An absolutely certain diagnosis of the case: Pentastomum coryza can be established only when it is possible to demonstrate the presence of pentastomum eggs in the nasal secretion. These are oval shaped, brownish-yellow and reach a length of 90μ micra and a width of 70μ micra (see ill. 85). At the same time it is possible in rare instances to find a pentastomum in a dog that has died from true rabies. The writer may mention that he has also found cerebral symptoms in an animal that has been suffering from purulent (non-parasitic) nasal catarrh.

Treatment of pentastoma is advised in general only when the above-mentioned symptoms appear violent or the patient is greatly weakened, and consists in the injection into the nose of solutions (either by means of a syringe or by an atomizer) of boracic acid, creolin, chloroform, benzine, carbolic acid, lysol, vinegar, and other antiparasiticides, or by the application of the vapors of chloroform, formaldehyde, etc., or of blowing in powders that will produce sneezing (tobacco, pepper, etc.). All these preparations are rather difficult to apply, on account of the narrowness of the nasal passage in the dog. In very acute cases, the best method of procedure is to trephine the upper part of the nasal passage and going directly into that cavity inject it with solutions of turpentine, chloroform, corrosive sublimate solution and wash out the parasite. This can be accomplished by using a good-sized syringe filled with the solution (creolin 1, water 15, or emulsion of turpentine in linseed oil 1 to 10) and putting a small section of rubber hose on the end of the syringe; insert it into the opening and inject slowly, taking care to see that the animal's nose is depressed and so allow the flow to go over the location of the parasites.

DISEASES OF THE LARYNX

Acute Laryngeal Catarrh

(*Acute Laryngitis.*)

This is generally observed in the spring and autumn, and at times seems to be epidemic; it may be caused by lying in a draught, being bathed in cold weather, cutting the coat too early, or sudden changes of temperature. It is found more frequently in delicate or pampered dogs, these animals catching cold much more easily than hardier animals.

Etiology.—The most common cause of catarrh of the larynx is cold; laryngitis rarely originates from direct irritation by agents that affect the mucous membrane of the larynx, such as inhalation of smoke, dust, irritating gases, foreign bodies, etc. It may result from constant barking, as when an animal is exhibited at a show and barks constantly, or through lying near a fire and getting very warm and then going and lying at the door, where the draught will come on the head and throat. It may also result from pressure on the larynx from without (pulling on the collar).

Laryngitis appears as a secondary symptom of acute inflammation of the nose, trachea, and bronchi, and it is generally one of the precursory symptoms of distemper.

Pathological Anatomy.—The mucous membrane of the larynx is partially or entirely reddened, inflamed, and swollen, and covered with mucus over its entire surface; this mucus is rarely purulent; in serious cases, the membrane is eroded or ecchymosed in spots. Fibrinous (croupous) coatings, as a result of which the reddened mucous membrane appears white as if sprinkled with snow, or grayish white, or yellowish, are rarely seen.

Clinical Symptoms. The first noticeable symptom is a cough; this may be very loud, according to the condition; it is always coarse, hard and dry in the beginning; later more frequent and drawn out, it becomes softer and more moist as it is accompanied with a discharge of mucus, and the animal may retch and act as if going to vomit, or actually vomits.

By a slight pressure on the glottis we can make the animal cough, and the larynx seems to be painful on manipulation; running, excitement, drinking cold water, or the administration of medicine all produce coughing. Difficulty in respiration is seen only in severe forms of laryngitis where there is intense inflammation and great swelling of the mucous membrane; it is sometimes accompanied by more or less wheezy or rattling sounds which appear especially when the dog exercises or is excited and also in case of slight laryngeal catarrh and which can be heard by placing the ear on the larynx. There is not much constitutional disturbance in the milder forms of this disease; in more acute cases, the animal is depressed and eats less and more slowly; this is probably caused by a certain amount of irritation extending to the muscles of deglutition, and to swelling of the mucous membrane, or from some form of pharyngitis, which may be present at the same time; if so, it is generally accompanied by a slight rise of temperature and loss of appetite. This condition in young dogs should always be watched very carefully, as it may be one of the premonitory symptoms of an attack of distemper.

The disease generally lasts only a few days, but if a case is neglected and does not receive care and proper treatment, it is apt to remain irritable and become chronic.

Therapeutics.—The first thing to do is to remove the animal from cold draughts and eliminate all influences (impure air, dust, smoke, excitement, draught) that would tend to make the disease worse, and apply friction, with some mild liniment, over the larynx; also the application of a moist warm compress over the larynx with the inhalation of medicated vapors, a pinch of belladonna leaves or a teaspoonful of tincture of benzoin in boiling water, and internally the administration of some expectorant or narcotic.

In case of tendency towards a chronic condition, use spraying solutions that will loosen the mucus, e. g., 1-2% solution of common salt, sodium bicarbonate, or Carlsbad salt.

These medicines should only be administered when the cough is persistent and the violence of it tends to aggravate the irritated condition of the mucous membrane; morphine is the best, as it lessens the cough and irritation; it can be administered with potassium cyanide and syrup of wild cherry. The following prescriptions are very useful where the animal is a small pet dog, that is, one kept in the room; it tends to prevent the cough, which is always worse at night:

℞.	Morphin hypdrochloric.	0.1
	Aq. amygdalar. amar.	15.0
	Sig.—Ten to twenty drops several times a day, especially evenings.	
℞.	Codein. phosphoric.	0.5
	Aq. amygdalar. amar.	15.0
	Sig.—Ten drops three times a day.	
℞.	Morphiæ sulph.,	0.1
	Aq. amygdalar. amaræ,	24.0
	Sig.—Half a teaspoonful three times daily.	
℞.	Morphiæ sulph.,	0.12
	Potassii cyanidi,	0.15
	Syr. pruni virginianæ,	96.00
	Sig.—One teaspoonful four times daily.	
℞.	Ext. hyoscyami,	1.0
	Liq. ammon. acetatis,	20.0
	Sig.—Twenty drops every half hour.	
℞.	Heroin hydrochloratis,	0.1
	Aquæ,	150.0
	Sig.—One to two teaspoonfuls every six hours.	

Occasionally we may find a foreign body, e. g., grain spikes, chaff pieces of blades of grass or straw, insects, etc., in the larynx presenting the following symptoms: Dyspnœa accompanied by loud coughing or whistling sounds mingled with the coughing, great anxiety shown on the animal's face; cyanosis of the mucous membranes. If the animal is actually choking, perform tracheotomy immediately. The operation is performed in the region of the 3rd to 6th tracheal rings by simply incising the trachea in the same manner as with the horse, then later on, or immediately, if conditions are less dangerous, endeavor to dislodge the foreign body and if this is not successful laryngotomy is indicated.

The œdema of the glottis mentioned previously, i. e., œdematous swelling of the epiglottis and vestibulum laryngis, can result from other causes than foreign bodies that greatly irritate the mucous membranes of the larynx, as, for example, by hot air, or sharp irritating gases, or it may result secondarily in connection with severely diseased neighboring organs (pharynx, tongue, parotid, lymphatic glands). It occurs as an œdema due to the obstruction with a slow development especially in chronic heart and lung diseases. The therapy corresponds to the one previously mentioned in case of possible suffocation. If the case seems less serious the inhalation of water vapors, painting with astringents (see above) and Priesznitz or hot compresses can be tried.

Chronic Catarrh of the Larynx

(*Chronic Laryngitis; Convulsive Cough; Chronic Irritable Cough.*)

Etiology.—Chronic laryngitis generally results from one or repeated acute attacks of laryngitis, or from chronic catarrh of some of the other organs of the air-passages; the pharynx, trachea, or bronchi, etc. It may also form gradually as a result of lasting or often repeated irritations of its larynx (see above); may also accompany all swelling or ulceration of the pharynx, or the formation of a tumor in that organ. Furthermore, a chronic cough may result from the pressure of a tumor upon the larynx, trachea or vagus.

Pathological Anatomy.—The mucous membrane is thickened, uneven, gray or dirty gray-red in color, but not so red as in acute laryngitis; it is marked with fissures and elevations due to thickening, caused by the chronic inflammatory processes; and here and there may be noticed a dirty bluish-red coloration. The surface is granular, on account of the swelling of the inflamed mucous glands; in rare cases, we may see small papilliform elevations or small eroded or ulcerated places which mark a breaking-down of some of the mucous glands; the secretion which covers the affected parts is thick, slimy, and tenacious. Occasionally there are also cases in which macroscopic changes of the mucous membranes are almost entirely lacking.

Clinical Symptoms.—The symptoms are similar to acute laryngitis except that they are not so severe; the larynx is slightly sensitive to pressure, showing that some irritation is present; the animal will cough after manipulation, but not to such a marked degree, and he does not try to get away from the pressure, as would be the case in the acute form, and there is no disturbance of the general system. Chronic laryngitis also runs its course without fever. The cough sounds dry, hoarse, and rough, sometimes moist, and is frequent, quite loud, and accompanied by a wheezy inspiratory sound, often with retching or even emesis, night being the time it is mostly heard, or when the animal runs about and plays and he is going to be taken out for a run. In some cases the cough resembles the whooping cough of children (tussis convulsiva). As a rule the respiration is not increased, but in chronic cases where one attack follows another the respiration is greatly increased with the slightest exertion. Some animals make a wheezy noise as though there was a decided contraction of the larynx. This latter condition may continue for years, and the chronic cough in particular is constantly present. Naturally relapses are very apt to occur.

Therapeutics.—As a rule, the treatment of this disease is unsatisfactory; this, of course, depends to a large extent on the animal. Being removed from the conditions that have originally caused the disease, the first thing to do is to keep the animal indoors, perfectly quiet and protected from cold, with rest, and avoiding excitement or prolonged howling. The average owner of a dog does not care or does not have the power to carry out these provisions for many weeks.

Among the agents used in general treatment the following are best: Priesznitz compresses (at night); inhalations of hot medicated solutions of Creolin water (½-1%), Ichthyol water (1 ichthyol, 50 water), or of Oleum Juniperi, Oleum Eucalypti, Oleum Pumilionis (pour several drops into the fluid to be vaporized or atomized or upon a handkerchief which is then held to the nose of the patient), Carbolic Acid, Tar, Oil of Turpentine or Powdered Salt, Chlorate of Potassium, Alum, or Tannic Acid (1-2%), Silver Nitrate (0.1-0.5%), or in case of severe irritation to cough, Potassium Bromide (1-2%), Cocaine (.25:100), or Diluted Bitter Almond Water (1 bitter almond water, 50-100 water). Inhalations with these agents by means of an atomizer, or by vapor bath, should be made twice daily for ten or fifteen minutes.

It is readily understood that inhalations are rather hard to administer in the dog, as the animal cannot be kept still while the medication is being made, and also because the dog breathes through the nose, and if prevented from doing so the vapor is carried into the throat and again into the mouth. The only practical way to get an animal to inhale a vapor is to put him in a close box and through an opening introduce steam that fills up the apartment; then the animal has to inhale it. This, however, can be practiced only in a hospital. But where the animal is at home, the best method of procedure is to place him on a cane-seated chair, and having placed the medicated agent, steaming hot, under the chair, cover the animal with a sheet and hold him for ten or fifteen minutes; or we may also hold the steaming vessel under his nose and cover the head. It is only with the greatest difficulty that the laryngeal mucous membranes can be painted with any medicinal agent. This is to be regretted, as it is the only direct way that the membrane can be treated with any certainty. In making local applications to the larynx an assistant holds open the mouth by means of tapes, the tongue is pressed downward by means of a spatula or the handle of a spoon, and the throat is sprayed by means of an atomizer or a brush or a quill. With good-natured dogs this can often be done as easily as with people, i. e., by means of the atomizer the vapor may be led directly into the larynx through the open mouth, by depressing the tongue with the index finger. The result is much better with local applications for when only inhalations through the nose are carried out, none of the salt solutions reach the larynx. Undoubtedly the fineness of the spray is of great importance. Further instructions concerning the arrangement of the apparatus can be gained from Fig. 87 or insert. No information can be given here regarding construction of the large inhalation apparatus used in clinics.

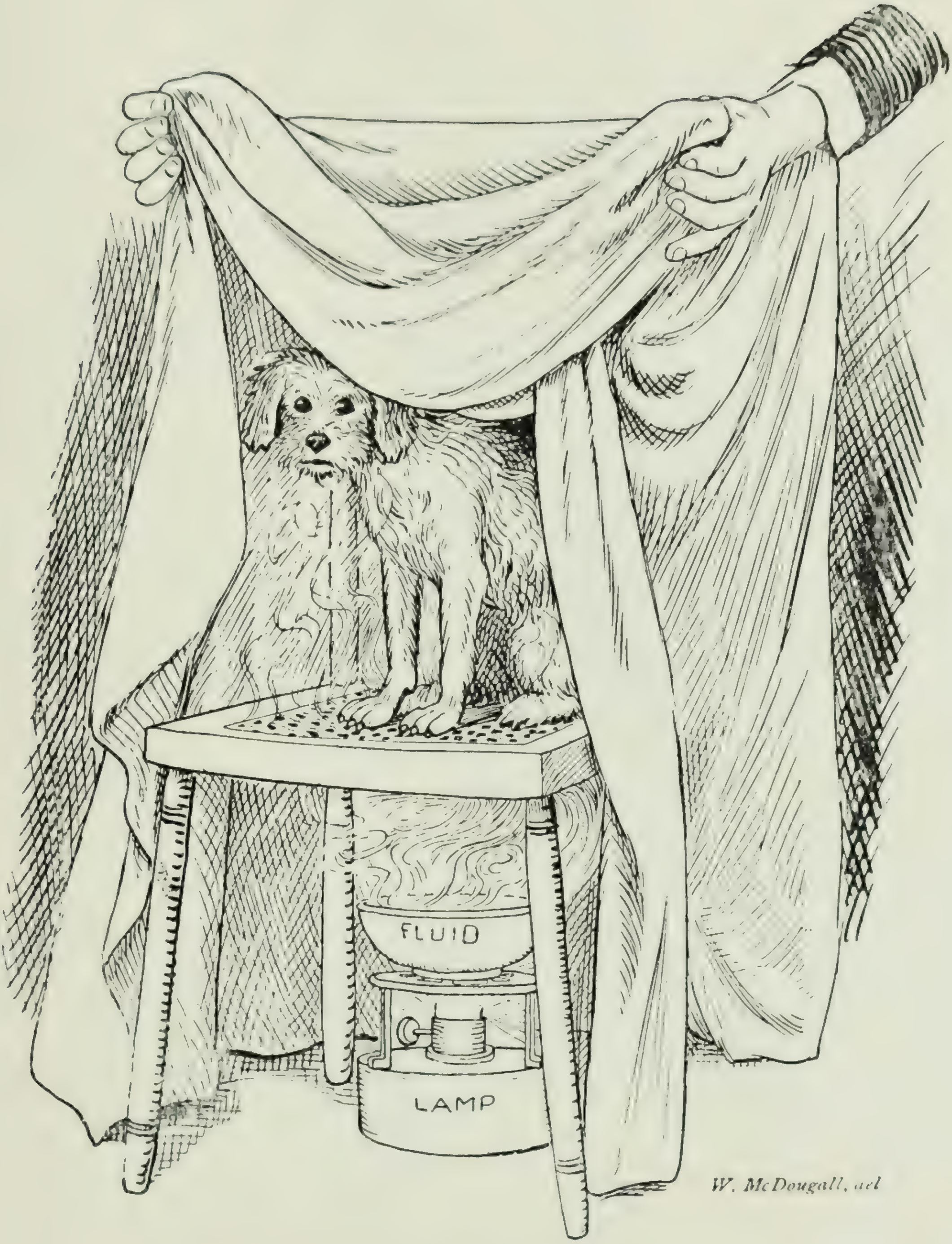
The treatment consisting of painting, insufflating or intralaryngeal injection are without a doubt more efficacious than the inhalation. These methods can however be used only under certain conditions and sometimes not without danger. For touching or painting the mouth is opened, the tongue depressed or pulled out as described previously and then the throat is painted by means of a long-handled brush. The insufflation is done by means of a specially adapted powder bellows or quill if preference is not given to applying the powder to the diseased mucous membrane by means of a brush. The painting and insufflation presuppose a certain amount of good nature and indifference on the part of the patient and can only be done well with dogs that have short heads. If the animal becomes very much excited or coughs violently during the preparation (while the mouth is being opened or the tongue is being held) it is advisable, at least in private practice, to discontinue the treatment. For the painting the following solutions are generally recommended: 0.5-2% solutions of Silver Nitrate, 5-10% solutions of Tannin in glycerine and Iodo-Potassium Iodide, Jodjodkalium solution (0.05 Iodine, 2.0 Potassium Iodide, 10.0 Glycerine); for insufflation, Silver Nitrate (0.1:1.0 sugar), Tannin or Alum (with sugar āā); in case of severe coughing irritation, Morphine (0.01-0.05:1.0 sugar or Amylum), Cocaine, Eucaine, Orthoform (0.01:0.2-0.3 sugar) are advised. The intratracheal method of administration of medicinal agents is rather difficult to follow out, particularly in animals that are fat or have short necks; insert the needle beneath the larynx or through the crico-thyroid ligament, but in the median line of the neck. The solutions to be used are: 0.5-1% solution of Alum, Tannin, Zinc Sulphate, Silver Nitrate, Lead Acetate, and in case of severe coughing 0.5-1% solution of Morphine or Codeine. These injections should be made daily or every other day.

The inhalations should as a rule be made two to three times a day and each time from 10-15 minutes; the painting, insufflation, under ordinary conditions once a day or only every few days.

Frequently in chronic catarrh we use, internally, narcotics to stop the severe cough produced by irritation of the membrane—Morphine, Codeine, Heroin, and in rare cases Bromide of Potassium or Chloral Hydrate. Expectorants are not of much use in the dog.

Hemiplegia Laryngis

This corresponds to the laryngeal whistling (recurrent laryngeal paralysis) of the horse and was occasionally observed by the author in the dog. In this



MODE OF ADMINISTERING MEDICINAL VAPORS.

affection the animal has a peculiarly shrill bark, which is varied in tone, becoming harder and harsher and spasmodic, accompanied by great difficulty in respiration, marked dyspnœa and roaring sounds during respiration. These symptoms appear even during rest, if the disease is very severe, but otherwise only when the animal moves about and then with a whistling inspiratory sound. Upon examination of the interior of the larynx the paralyzed (usually left side) vocal cord is seen to be absolutely motionless, in a median position (cadaver position), during respiration, or moving very slightly, while the other vocal cord, which is not paralyzed, is in much greater motion. The arytenoid cartilage of the paralyzed side may be bent inward and downward so that the larynx seems asymmetrical. In cases that have been recorded the dissection generally showed a left-sided atrophy of the cricoarytenoideus posticus, especially of the left Musculus cricoarytenoideus posticus; in one case this was also established intra vitam by palpation of the larynx. The causes cannot be determined wtih certainty. The condition may be produced by dragging on a collar, according to the report of one owner, or follow traumatisms, as in one case observed by Frick, that is, fracture of the first rib on the left side, and it was also seen following five months of the pulmonary form of distemper, with protracted reconvalescence. The treatment consists of the application of a galvanic battery over the region of the recurrent nerve or of rubbing the region with irritating fluids or salves, the administration of nux vomica or Fowler's arsenic solution internally, or of strychnia subcutaneously. In cases of long standing the only treatment remaining is, as with the horse, an operation.

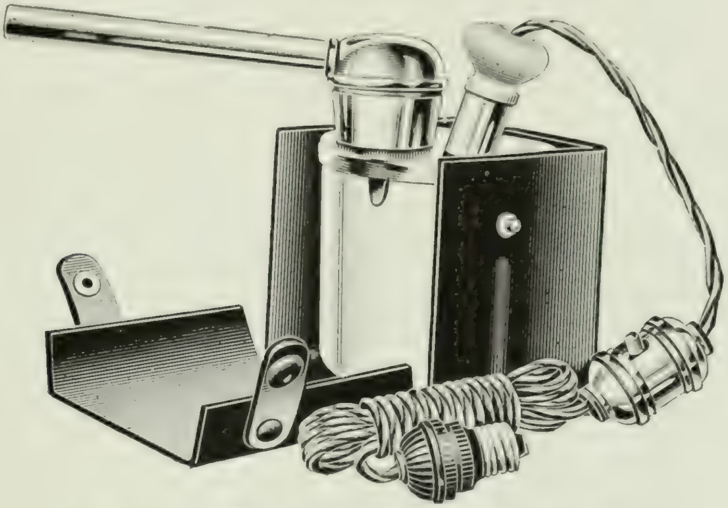


FIG. 87.—Sharp & Smith's canine vaporizer.

Laryngeal Tumors

It seems that tumors (new formations) of the larynx are of rare occurrence and produce symptoms that somewhat resemble those of Hemiplegia Laryngis, but also produce coughing which occurs temporarily or in spells. The cases can be determined intra vitam with certainty only when they are located in the anterior regions of the larynx that are directly visible. Polyplike, lobed or warty formations can moreover also be of tubercular nature. Anamnesis, general state of nutrition, the condition of the regional lymphatic glands and the result of the tuberculin test are the determining factors in such cases. Tumors of the larynx can be removed surgically. Dogs suffering from malignant laryngeal tumors or from tuberculosis of the larynx should be destroyed.

DISEASES OF THE AIR-PASSAGES AND BRONCHIAL TUBES

Catarrh of the Windpipe and Bronchia; Bronchitis

(*Trachitis and Bronchitis Catarrhalis*)

Etiology.—Catarrh of the air-passages and of the bronchia occurs very frequently in young, weakly, or debilitated dogs. It sometimes originates primarily, but, as a rule, it occurs as a secondary disease. Primarily it is caused by cold, especially by breathing cold air when the animal is warm; and in pet dogs we see it quite often where the animals will lie near the register or an open fire until they are very warm and then go to the outside door and lie on the floor where the draught can strike on them and so cool off very rapidly, and repeat this a number of times. It is also caused by mechanical or chemical irritants, such as smoke, dust, parasites, strong gases, particles of food that have escaped into the trachea through wrong swallowing, or secondarily, from the extension of inflammations from neighboring organs, as the larynx or lungs, or in a more chronic state from defective blood circulation of the lungs, produced by weakened heart action. Catarrh of the trachea and bronchia is almost always seen as a complication of distemper, as well as in connection with many serious acute and chronic internal diseases, especially in affections of the brain. The latter condition (bronchial catarrh) in very ill individuals is generally traced to the fact that there is an accumulation of particles of food and secretions, which collect in the mouth and throat, decompose, and from here chemical and organized inflammatory excitants are respired into or in some other way get into the trachea and its branching passages and produce an irritation.

There is no doubt that infectious influences play a certain rôle in the cause of this disease.

The power of resistance of the mucous membranes against microbes was lowered by the preceding cold. Especially in Spring and Fall bronchitis among dogs of all ages (principally young dogs) is seen to appear in epizoötic form, without having been able in every case to name a "cold" as the cause. In such cases it may be very difficult to distinguish between the bronchitis and distemper.

Pathological Anatomy.—In describing any catarrh of the trachea it should be classed under the head of bronchitis, as it is impossible to draw the line of distinction between the two. In acute bronchitis the mucous membrane is diffusely inflamed, swollen, sometimes streaked here and there with blood. In the earlier stages of the disease the mucous membrane is almost dry or damp, shiny and little mucus is found on it, but as the disease goes on to the later stages the secretion becomes more copious and turbid, purulent, and filled with pus corpuscles; later on it becomes more or less colored with blood corpuscles.

Chronic Catarrh.—In this condition, the color of the mucous membrane is grayish red or brownish red, and the membrane is frequently uneven and thickened; in circumscribed spots or covering the entire membrane the secretion is clammy, slimy, or shining; in some cases it is purulent, bad-smelling or even putrid, similar to atelectasis.

In old cases of chronic bronchitis, there may be some stenosis of the tubes, and also, from the constant irritation of the bronchia, emphysema of the lungs. In regard to this the reader is referred to works on pathological anatomy.

Stenosis (contraction) of the bronchia may be caused either by swelling of the bronchial mucous membrane or by the collection of masses of thickened secretion in the tube. In some cases, the two causes acting together exclude the air from the alveoli of that part of the lungs to which the affected bronchia carry the air, causing the lung-tissue to collapse. This condition, which originates in the manner described, does not change its structure, but soon becomes solidly filled with blood.

In all chronic conditions, we also find the opposite of stenosis, that is, bronchiectasis (widening of the bronchial tubes); this is caused by a relaxed condition of the bronchial walls, due to the chronic irritation and also to the pressure of collections of the secretions. This dilatation of the tubes may be either cylindrical or spindle-shaped.

Emphysema of the Lungs.—This is found near the atelectatic centers and on the borders of the lungs; this condition is supposed to be caused by violent coughing spells and also by bronchitis. The affected parts do not collapse, but appear soft, clear and bloodless; they will, however, collapse quickly on incision.

Clinical Symptoms and Course.—These vary, according to the amount and location of the irritation, whether it is in the trachea, large, medium, or small bronchia, and whether it is acute or chronic.

1. **Acute Catarrh of the Trachea and of the Large Bronchia.**—This generally commences with slight and frequent chills, accompanied by fatigue, indifference, depression, loss of appetite, and sometimes with a stiff and strained gait and, at least in more severe cases, slight rise of temperature, which may, only in cases arising from severe infection, rise to 40° C. or higher. Soon afterward the animal commences to cough; this is one of the principal symptoms of the disease. In the

beginning it is short, weak, painful and dry, later it becomes moist, loose, stronger and more frequent. It can easily be started by slight pressure on the trachea and also by tapping on the chest close behind the shoulder.

Percussion, as a rule, does not reveal the full extent of the disease. On auscultation, in mild cases, we hear scarcely anything but an increased vesicular respiration in the trachea, its nearest branches and large bronchia, and when the larger and medium-sized bronchia are affected there is an accumulation of mucus in the tubes and a swelling of the mucous membrane, causing an obstruction of the tubes and a consequent decrease in the lumen and the vesicular murmur is increased. This is due to the fact that while the bronchitis is in the dry stage the sounds are roaring or snorting in character, and when the fluid mucus has accumulated the sounds become moist and rattling, as if the air was passing through a thick mucus (mucous râles). The intensity (volume) of the sound will depend upon which bronchia (the large or medium) are concerned). The respiration is scarcely more difficult, at least during rest. Acute catarrh of the trachea and large bronchi usually disappears after 8-14 days of its own accord; if, however, the causes continue, and in case of very young and very old, as well as greatly debilitated dogs, it may pass over into one of the following forms:

2. **Acute Catarrh of the Smaller Bronchia; Bronchitis Capillaris; Bronchiolitis.**—This form of catarrh practically always results from the preceding or appears with it and may have an unfavorable outcome with very old dogs and also with young ones with whom it may sometimes develop during the course of distemper. Bronchitis capillaris appears less often in full grown, healthy dogs and if so usually has a propitious ending.

When the small bronchia are affected, these sounds are much more decided, and in this condition there is high fever, very rapid pulse and general disturbance of all the functions, and also a marked difficulty in respiration, and the disease takes a much more serious course, particularly in young dogs affected with distemper. One prominent symptom in the dog is the inflation of the cheeks with each expiration. Excitement or lifting the patient, as well as any pressure on the walls of the chest will immediately produce a fit of coughing. The cough is first generally often suppressed, dry, dull and weak, and as the disease increases it becomes looser and easier, the vesicular sounds being loud, fine and very wheezy. Capillary bronchitis in young and very old animals is very apt to terminate in catarrhal pneumonia, but even if this grave complication does not occur, it is still a very dangerous disease and is apt to prove fatal. The course of the disease is never less than two weeks, and may often last several weeks with varying degrees of intensity before the animal makes a recovery.

This disease, or the results of it (Chronic Bronchial Catarrh), is what is generally termed **asthma,** so often seen in young and old, well-cared-for dogs. The disease is characterized by a certain amount of difficulty in respiration, at first very slight, but gradually with a steady increase, which is increased by running, exertion, or by any excitement, and is generally accompanied by a worrying, distressing attack of coughing, which in severe cases ends with every evidence of choking or even vomiting. The cough is generally moist, and may be accompanied by a certain amount of rattling, but is never severe. In the majority of cases, where the disease is not far advanced, the animals enjoy good health and rarely exhibit any fever. In old cases, the expired air may be bad-smelling or fœtid.

Percussion gives no definite results. If, however, no resulting after-effects have appeared then percussion usually produces a loud tone while auscultation produces many or few dry or moist rattling murmurs of various character. Auscultation gives sounds that depend on the number and size of the diseased bronchia and the character of the mucus accumulated in them. We may find either moist or rattling sounds, which vary in character, and a heightened vesicular respiration or else an indistinct mucous sound.

Therapeutics of Tracheal and Bronchial Catarrh.—Keep the animal in a moderately warm but well ventilated place, where it is dry and free from draughts. In the early stages of the disease give a mild expectorant, such as Syrup of Tolu or Wild Cherry. Local inhalation of vaporized drugs is not of much use, as very little of the drug is carried into the bronchial tubes, especially the small ones. We may in case of a dry cough or stagnating excretion, administer medicinal vapors by putting a teaspoonful of Tincture of Benzoin, or if the expressed air is fœtid, a weak solution of Creolin, Lysol, or Carbolic Acid in a quart of boiling water, or sprayed solutions of Common Salt or Sodium Bicarbonate. It is also advisable to keep the air of the room moist by hanging up damp cloths or by vaporizing or spraying with water, and hold it so that the animal will inhale the steam, or a Priessnitz compress may be put around the thorax; this should be taken off and adjusted every three or four hours. The skin should be rubbed dry every time the compress is changed.

In the chronic cases, we generally get good results from the administration of expectorants, such as Apomorphin, Ipecacuanha, Ammonium Chloride, Tartar Emetic, Antimony Pentasulfide, "Liquor Ammonii Anisatus," Senegæ, and Spirits of Mindererus; and where there is a violent cough, add narcotics, such as Morphia, Extract of Hyoscyamus, or Dilute Hydrocyanic Acid or Cyanide of Potassium. When there is fever present, a few doses of Antipyrine (0.5 to 1.0 gramme, twice daily) will generally suffice.

If the disease threatens to become chronic, good results may be obtained from the use of Pilocarpin given in very careful doses, Potassium Iodide, and Sodium Iodoxy-Albuminatum.

℞.	Ammon. chlorat.,	4.0
	Succ. liquirit.,	10.0
	Aq. fœnicul.,	150.0

Sig.—One-half to one tablespoonful to be given three times daily.

℞.	Infus. rad. senegæ,	10.0:120.0
	Sirup. liquirit.,	15.0
	Liq. ammonii anisat.,	4.0

Sig.—One-half to one tablespoonful to be given every two to four hours.

℞.	Apomorphin hydrochlor.,	0.02
	Acid hydrochloric.,	0.3
	Aqu. destill.,	150.0

Sig.—One coffee to one tablespoonful to be given every two hours.

℞.	Syrup. ipecacuanhæ,	
	Syrup. althææ,	ãã 25.0

Sig.—One coffeespoonful every three hours.

℞.	Sodium iodoxy-albuminat.,	2.5
	Spiritus,	7.5
	Syrup. senegæ,	15.0
	Aq. destill., ad	100.0

Sig.—One-half to one tablespoonful three times daily.

Since the cough serves to help eject the secretions it should not be combated. In general steps should be taken to check the coughing only when the cough is very dry and painful.

Tartar Emetic, Chloride of Ammonium, and Sulphuretted Antimony are of little use; in fact, do more harm than good, as they often destroy the appetite and cause great depression. In the early stages of the disease the cough does not amount to much, but in the later stages, it is constant and very disagreeable, especially at night, and it is in such cases that expectorants are useful to remove the accumulations of mucus. The addition of Morphia to the Apomorphia solution has the tendency to counteract the emetic effect of the latter drug.

One important factor in this disease and especially in bronchitis capillaris with very young and very old dogs, is to keep up the general system by giving nourishing but easily digested food of a mixed character and in concentrated form, and according to the condition of the patient, administer Camphorated Wine; Coffee, Tea or Brandy in small quantities. If the heart should give evidences of weakness, use stimulants—Brandy, Atropin, Scopolamin, Caffein, Ether, Spirits of Camphor, or Digitalis.

R.	Scopolamin. hydrobrom.,	0.05
	Aq. destill.,	10.0

Sig.—To be given in subcutaneous injection for weak heart (1 gramm injection per dose).

In chronic bronchial catarrh where a permanent cure is not to be expected, we can alleviate the sufferings of the animal by inhalations of Tincture of Benzoin or Balsam of Peru, one teaspoonful to a cup of boiling water, or by means of the vaporizer; inhalations of medicated vapors are very useful, and especially the vapors of Turpentine, where there is a great accumulation of mucus and a fœtid breath. Inhalations of the vapors of Tar and Creosote are also useful. The action of tar is a little irregular and occasionally destroys the appetite. Ichthyol and Thiol are given in doses of 0.2 to 0.5 gramme several times daily.

In case of dry catarrh the following remedies may be tried in addition to those previously mentioned:

Common salt, Sodium Bicarbonate or Carlsbad salt; in case of very tough secretion, Potassium Iodide (2 to 3 times daily 0.1-0.5), and for copious excretion Oil of Turpentine, Terpin. Hydrate, Benzoic Acid, "Myrtol," Balsam of Peru, Tar, Creosote, Creosotal or Guaiacol. Spells of very irritating distressing coughing may sometimes be checked by Tincture of Lobelia. Suitable nourishing food should be given and all conditions that might increase the ailment should be removed. In secondary chronic bronchitis the primary ailment should also be treated.

℞.	Terpin. hydrat.,	2.0
	Spiritus,	
	Aq. distill.,	
	Syrup. menthæ,	āā 50.0

Sig.—Several tablespoonfuls to be given daily.

℞.	Creosotal,	10.0
	Ol. Jecoris Aselli,	100.0

Sig.—One coffee spoonful to be given twice daily, gradually increase to one-half tablespoonful.

℞.	Myrtol,	0.15

D. in caps. gelat. tal. dos. No. xx.

Sig.—Two to three capsules daily.

℞.	Tinct. lobeliæ,	5.0
	Aq. amygdal. am.,	15.0

Sig.—One to fifteen drops every hour or two.

Narcotics should be administered only when the cough is very severe.

℞.	Morphiæ sulphatis,	0.09
	Potassii cyanidi,	0.13
	Syr. pruni virginianæ,	88.0

Sig.—One teaspoonful four times daily.

R	Tinc. aconiti,	0.05
	Tinc. belladonnæ,	0.03
	Tinc. bryoniæ,	0.02

M. F. Triturat No. i.
Sig.—One tablet three times daily.

Narcotics are also often administered with expectorants.

R.	Morphine hydrochlor.,	0.01
	Stib. sulfurat. aurant.,	0.1
	Sacchar.,	0.5

M. fiat pulvis D. tal. dos. No. v.
Sig.—Give two to three powders daily.

R.	Pulv. ipecacuanh. opiat.,	0.3

D. tal. dos. No. v.
Sig.—One powder every evening.

In rare cases when symptoms of suffocation indicate an unusually great accumulation of mucus in the bronchials it may be necessary to give an emetic, e. g., previously mentioned apomorphin; and usually excessive amounts of thin secretion can be temporarily lessened by Atropin Sulphate (0.002-0.01) subcutaneously.

Parasitic Bronchitis

The following parasites produce bronchitis; parasitic bronchitis, however, is very rare.

Strogylus Bronchialis Canis (Osler); *Filaria Tracheo-bronchialis* (Blumberg Rabe).—These parasites are very small thread-like worms (female 9-15 mm. long, 0.11 mm. thick; male smaller), and lodge in the mucous membrane of the posterior regions of the trachea and in the large bronchi, forming grayish-red wart-like rather firm globular protuberances on the inside, ranging in size from that of a small pea to a coffee bean, and fungus-like or broad nodules (tracheitis verrucosa verminosa) on the mucous membrane. These parasites cause severe coughing, dyspnœa, great weakness, fever, vomiting, and colicky pains.

Strongylus Vasorum (Baillet).—These are long thread-like worms (adult stage 1-2 cm. long) which lodge in the right side of the heart and the pulmonary artery. The eggs are carried by the blood into the lungs, and lie in the minute branches of the bronchi (bronchioles), forming fine nodules resembling those of tuberculosis; the embryo is liberated, gets into the bronchi, causing irritation and coughing, and the young parasite is expelled with the mucus coughed up, or some of the parasites are swallowed and thus find their way into the alimentary tract and it is believed then into the veins, and are carried back to the heart. Animals affected present the following symptoms: dyspnœa, ascites, and emaciation.

Trichosoma aerophilum is rarely found in the air passages. Dogs afflicted with Strongylosis vasorum pulmonum, show difficulty in breathing, emaciation, and dropsical manifestations.

The Spiroptera sanguinolenta also find their way into the air-passages, causing chronic bronchitis.

DISEASES OF THE LUNGS

Catarrhal Inflammation of the Lungs; Pneumonia

(*Catarrhal Pneumonia; Lobular Pneumonia; Broncho-pneumonia*)

Etiology.—Catarrhal inflammation of the lungs generally originates as a secondary disease following bronchitis, by an extension of the inflammation of the small bronchia into the alveoli, or from the obstruction of the bronchial tubes; it may originate primarily as pneumonia or in the pulmonary form of distemper. Therefore all causes that lead to bronchitis may also result in catarrhal pneumonia. Certain animals, such as very old dogs, or young animals, undeveloped and underfed, as well as animals that have gone through some acute illness, are predisposed to the development of lobular pneumonia. Lobular pneumonia is caused by accumulations of mucus in the trachea which may be only imperfectly coughed up, or in very weak cases, lying in the tubes, become decomposed and putrid, and so act as an irritant. These particles of mucus are carried into the deep portions of the lungs, directly on the alveoli, and form a capillary bronchitis; it may become converted into a catarrhal pneumonia. Particles of food, saliva and other accumulations collect in the mouth and pharynx, become decomposed and putrid; inflammatory irritants (fungus, bacteria) are aspirated from these places into the bronchi; bronchitis results, then bronchiolitis and then catarrhal pneumonia. In some cases particles of food, medicines, especially thick mixtures, get into the larynx when the animal is unconscious or during vomiting, belching, incorrect swallowing, or where there is partial paralysis of the throat. This may also happen with absolutely healthy dogs, as with dogs that eat greedily. These substances penetrate into the lungs and are very difficult to dislodge from the bronchia. This form of the disease is generally termed traumatic or aspiration pneumonia. It is acknowledged that many of the cases of bronchopneumonia that have been observed, if not associated with distemper, belong to the group of traumatic pneumonia.

Roberts has described catarrhal pneumonia in an epidemic form attacking all ages, developing a high temperature, and loss of 30 per cent. Savarese has described a specific pneumococcus, but in all probability both observers have described a condition similar in nature.

Pathological Anatomy.—In a lung affected with catarrhal pneumonia, we always find all the characteristics of bronchitis, and as the disease advances, the group of alveoli that belong to the affected bronchia are rapidly filled with the catarrhal deposit, preventing the air from penetrating into them, and after the resorption of the air that still remained in them they collapse (Atelectasis). So long as the centers are purely atelectatic, they can be filled with air blown in from the bronchia. Soon however the inflammatory excitants gain entrance to the atelectatic area and acuse an intense hyperæmia of the walls of the alveoli and the exudation of a thin, non-coagulating fluid, and numerous white blood corpuscles, which soon become pus corpuscles, also sporadic erythrocytes, and the commencement of a fatty degeneration and detachment of the alveolar cells. The alveoli and the small bronchia become entirely filled with pus corpuscles and a certain number of blood corpuscles and broken-down epithelial cells, and the inflamed portion of the lung can easily be distinguished from its healthy surroundings, forming firm, friable, tough, roundish or lobulated lumps, which vary in size and number, projecting slightly above the surface of the lung, and on making a cross-section of the diseased portions, in the earlier stages of the disease, they are seen to be dark bluish-red and later on become gray, grayish-red, grayish-yellow or light gray, while the surrounding tissue that is not diseased is normal or, what is more frequent, is slightly congested with blood. The detached centers, which show plainly in the early part of the disease, soon become confluent, so that finally we find large sections of the lung involved. In rare cases we find fibrinous (croupous) centers in connection with the catarrhal pneumonic centers and extended vesicular emphysema in the neighborhood of the affected centers, and at the borders of the lungs it is often seen. We may also have subpleural and interstitial emphysema and sero-fibrinous or pussy pleuritis about the broncho-pneumonic centers.

Clinical Symptoms.—It is very difficult to make a sharp distinction between capillary bronchitis and lobular pneumonia on account of the close relation between these two diseases. If the disease has affected the alveoli, there is a marked acceleration of the rspirations, in some cases as high as 60 per minute, and also inflation of the cheeks with each expiration; the cough is short, frequent, and apparently very painful, the pulse, especially with young animals, running from 150 to 170, temperature rises quickly and remains high. On making a physical examination by percussion, there are a number of dull centers through the lungs; in some instances the whole of the lung gives dull sounds on auscultation. According to the stage of the disease, we hear râles of various characters, strong vesicular breathing, snoring, fine or loud bruits, and where there is extended infiltration, we hear bronchial respiration and certain spots where there is no respiratory murmur at all.

The temperature often goes up to 40° or 41°; this high temperature usually comences early in the disease or it often makes a rise when the disease has become converted into catarrhal pneumonia. If this complication does not occur, the temperature will not make any marked change, but will follow a regular course, which is to rise quickly at the onset and gradually fall as the disease decreases and the animal goes on to convalescence. However, it may happen that the temperature continuously remains fairly high for some time. Often a mucous, purulent nasal secretion is observed.

Course and Prognosis. The course of catarrhal inflammation of the lungs is rarely less than three weeks, and is often prolonged over three months, with varying degrees of intensity, leaving the animal greatly debilitated. Traumatic pneumonia is the only form of the disease that runs its course quickly.

The evidences of termination of the disease are: Recovery by resolution, in which the inflammatory products, which fill the smallest bronchia and the alveoli, are changed into a form of emulsion and are either reabsorved or coughed up, or develop into a secondary disease, for instance, chronic interstitial inflammation of the lung or, in rare cases, the formation of abscesses or purulent gangrenous centers. Third, death, which may occur at any stage of the disease; in the early stages, as a consequence of great extension of lobular pneumonia or at any time as a result of **œdema of the lungs;** this is observed in very young animals that are very weak, particularly in the pulmonary form of distemper, but it may also occur in very old debilitated animals. Traumatic pneumonia, if it is acute, generally results fatally after a few days and little or nothing can be done to produce a favorable result.

Chronic Interstitial Pneumonia

(*Chronic Induration of the Lungs; Cirrhosis of the Lungs; Phthisis*)

When the disease terminates in this pathological condition we find an inflammatory deposit in the interlobular and interstitial connective tissue. This deposit compresses the alveoli and small bronchia, and they lose their functions and are finally absorbed, and on section of the affected portion of the lung it is found to be coarse, rough, and irregular on its surface, the tissue varying from grayish-red to yellowish-red in color and the lobules surrounded by connective tissue. The bronchia surrounding the affected portion are distended and pocket-shaped, and there are also a certain number of spots of localized emphysema.

The clinical course of the disease shows very little fever, but the animal is never entirely restored to health; the respirations remain short, labored, and with a quick, dull, weak cough. The affected animal becomes emaciated, the condition is complicated with dropsical effusions, and it finally dies from exhaustion.

In some cases of lobular inflammation of the lungs the inflamed portions form abscesses, or we may find portions of the lung that are gangrenous. These terminations depend on the nature of the irritant that has entered the alveoli, and generally occur after traumatic pneumonia (foreign bodies). When suppuration commences in the alveoli it always runs its course with severe cellular infiltration of the interalveolar tissue; the infiltrated center may disintegrate, an abscess is formed and a pear-shaped body is found in the center of the infiltrated lobule, and surrounding it is a thin, delicate layer of yellowish tissue and over that a tough layer of red inflamed fibrous tissue; large abscesses may be formed by the fusion of all the infiltrated pulmonary tissue.

Purulent pleuritis also develops frequently.

When gangrene has developed, the inflamed catarrhal center becomes dirty greenish-brown in color, or in severe cases, almost black. In the early stages the diseased portion is hard and fibrous, but it soon becomes soft and pulpy and filled with a turbid, fœtid, greenish serum. When the disease is slow and chronic, the gangrenous spots are limited in size by a reactive, demarcating inflammation, but generally when the disease assumes the gangrenous form, it becomes diffuse and the animal dies rapidly from exhaustion.

Furthermore, abscesses and gangrenous centers can originate in the lungs in an embolic manner. (See Pyæmia and Septicæmia.)

Of these two terminations, generally the gangrenous one only can be identified with any certainty because only the larger abscesses located near the upper surface of the lungs can be examined physically and because purulent discharge may also originate from the bronchi.

We recognize the gangrenous form when the breath becomes putrid, for in the dog it is almost impossible to get any of the discharge that is coughed up, the animal generally swallowing the mucus. Auscultation of the lungs may detect tympanic or metallic sounds, mucous râles and increased bronchial sounds. When gangrene (necrotic pneumonia) has developed, the animal has a putrid breath and a series of alarming symptoms, also especially evident in septicæmia, accompanying it—septic fever, chills, and a high temperature, with weak, irregular pulse. If the sputa were examined, we would probably find numerous micrococci, bacteria, and portions of broken-down lung-tissue.

Œdema of the Lungs.—This is apt to follow not only pneumonia, but all debilitating diseases that weaken the left side of the heart to such an extent that that organ is unable to force the venous blood through the lungs. There is a regurgitation of the blood, and the alveoli and bronchia become filled by a serous fluid which exudes from the blood vessels. The other ways in which œdema of the lungs may originate cannot be discussed here. The œdematous lung is distended and much larger than normal; on pressure with the finger the indentation remains some time. On section of the lung, a large quantity of reddish foamy fluid exudes from the tissues and the bronchial tubes.

When œdema of the lungs follows catarrhal pneumonia it generally begins with great difficulty in respiration, labored or stertorous in character, a short, faint dry cough, fear, restlessness, and in rare instances a quantity of thin reddish foamy fluid comes from the nose or mouth. On making a physical examination, percussion gives no results but those found in catarrhal pneumonia. On auscultation, we hear rattling bruits all over the chest, especially in the anterior part, and also in the trachea; the blowing sounds may be very loud in some cases, and can be heard some distance from the animal. Death occurs in a short time. It is of practical importance that some time before the actual symptoms of œdema appear, the exhausted condition of the heart is indicated by the pulse being irregular, that is, weaker at inspiration than at expiration.

Therapeutics.—In treating lobular pneumonia we follow the same general course as we do in bronchitis. The writer obtained the best results with Priessnitz's compress and from the remedies recommended under the treatment for bronchitis. The good effects of moist, warm compresses can be much increased by previously applying sharp friction with a small quantity of mustard oil to the sides but it must be applied only in young, strong, healthy animals. In cases of very young weak dogs, spirits of camphor can be substituted for the mustard oil. The best method of application is to make a liniment of 3 parts of oleum sinapis æthereum in 45 parts of olive oil and divide it into 2 parts and apply one-half to each side of the chest then wind a dry bandage around the chest walls and ten to twelve hours later apply Priessnitz's compress.

Rubbing with mustard oil when the compresses are being changed is very efficacious. The expectorants, etc., that may be used internally have been mentioned previously (p. 213). The author has had excellent results with sodium iodide, albuminate. Narcotics are to be given when the cough is constant and distressing; also aqueous solutions of phenol, which, however, may lead to phenol intoxication and should, therefore, not be used at all on weak or young animals and on others with great care. The general condition of the animal should be watched carefully. Where there is much debility stimulants such as wine or ether are indicated and the animal should be given small, often-repeated quantities of chopped meat, juice of meat pressed from raw beef, broth, milk, and the peptone preparations. In case of very high fever medicinals to counteract the fever should be administered as for example: antipyrin (0.25-2.0), antifebrin (0.2-1.0), phenacetin (0.2-1.0) or lactophenin (0.2-1.0). If animals absolutely refuse to take nourishment it may become necessary to resort to artificial feeding (see later under distemper). The owner's attention should also be called to the fact that the dog, even after survival of the disease, must be treated with great care for a long time and must especially be protected against colds.

Little good is to be derived from inhalations in this disease. When the breath is offensive we advise inhalations of benzoin, 4.0 to cup of boiling water. Inhalations of creosote are recommended, but on account of the danger of absorption and irritation of the kidneys by that drug they are to be used with extreme caution. In septic fever, after the appearance of gangrene of the lungs, give subcutaneous injections of ether or camphor. In case of sudden collapse or lack of breath (symptoms of œdema!), subcutaneous injections of atropin (0.01) or scopolamin (formula given on p. 212) may under certain conditions save the animal's life. Interstitial pneumonia is generally considered incurable; nevertheless alkalies or iodine remedies (potassium iodide, Jodipin) can be tried. Fibrolysin is also recommended.

When œdema of the lung is recognized, it must be regarded as a grave symptom for it is generally fatal. We must, therefore, take very energetic measures—active stimulants, such as mustard oil to the sides, and also injections of ether or camphor subcutaneously. When the heart becomes alarmingly weak it is advised to give strong coffee or tea, caffein, digitalis, tinct. strophanthus, camphor or alcohol.

Other Diseases of the Lungs

Catarrhal pneumonia is the only important disease of the lungs in the dog; the others which are here described are of small importance and rarely seen.

Congestion of the Lungs, Acute Hyperæmia of the Lungs.—This disease is comparatively rare, generally being observed in the summer, as a result of very severe exercise; for example, in hunting dogs, in warm weather, or animals running after cars, wagons, or bicycles until exhausted, or as a result of infiltration of the lung in ascites, or from cold air, gas, great heat or smoke if the animal has been in a burning house or kennel, etc.

The early acute symptoms which usually appear suddenly and violently, are greatly accelerated respiration, nostrils distended, mouth open, tongue deep blue to purple and hanging out, animal restless and excited, heart full, bounding, and easily felt through the chest wall, hard, rapid, full pulse, cyanosed mucous membranes, and if the acute condition continues for any length of time, apoplectic œdema, apoplexy, or acute pulmonary hemorrhage follows and death occurs in a very short time.

Therapeutics.—Keep the animal in the air or a cool, well ventilated room and let the animal rest, with no disturbing influences, and administer cold, slightly acidulated drinks. In grave cases use venesection, cold baths and soap clysters, and laxatives that act quickly and massage the skin. If œdema threatens, treat accordingly.

Croupous Inflammation of the Lungs; Fibrinous Pneumonia.—This is a firm, hemorrhagic exudation in the alveoli of the lungs and small bronchia. Is very rarely seen in the dog. The writer has never seen a case of true lobular pneumonia, but has seen a few cases of croupal lobular pneumonia, the course of which is very similar to that of catarrhal pneumonia in all its symptoms, the difference being detected only on post-mortem. Roll makes the statement that croupous inflammation of the lungs is common in the dog, but he probably meant croupal lobular pneumonia.

The clinical difference between croupal and catarrhal pneumonia is the rapid course in the onset of the former, the bronchial murmur, the typical course of the fever (generally 5-6 days, then declines), the appearance of comprehensive areas of dullness, bronchial breathing becoming evident over greater areas and frequent complications of pleurisy, due to the filling up of the bronchial tubes, the frequent complication of pleurisy and the quick formation of a pleuritic exudate.

Anthracosis pulmonum (*blackening of the lungs*), due to the inhalation of coal dust or coloring matter and found in animals living in cities or kept as watch dogs in factories where dust is constantly in the atmosphere, is quite common in the dog, but it has no pathological significance. This condition is often found at operations or when slaughtered.

Emphysema of the lungs is not such an important disease in the dog as it is in man and the horse. That form of emphysema which appears vicariously in the regions of impassible centers in bronchitis and pneumonia, pulmonary tuberculosis, and other conditions that lead to the disfunctioning of sections of the lungs, characterized by an extreme distention of the alveoli, has been mentioned under these diseases. If the irritation is constant, the disease becomes chronic and incurable and a progressive atrophy of the alveolar walls takes place until they are entirely closed up, the neighboring alveoli become absorbed or altered, and finally large cavities are formed, sometimes visible with the naked eye, and the blood vessels become atrophied. On section of the lung the affected section appears voluminous, pale, soft, with rounded margins, and the blood vessels are stained with pigment. Upon section it appears dry and more or less pigmented because the content of the decomposed blood vessels has been changed to pigment. Whether emphysema of the lungs in dogs can arise also as the result of purely nutritive disturbances of the parenchyma of the lungs, as so-called senile emphysema may not be true. Sometimes, as a result of severe exertion, such as vomiting, pregnancy, pulling, traumatism, or laceration of the alveolar walls, air is allowed to penetrate into the interlobular, interstitial, or subpleural connective tissue; this is generally caused as a result of severe and continual coughing spells and where animals have died from some form of suffocation. These cases of emphysema are called either interstitial or subpleural. Siedamgrotzky describes a case where an old emphysematous dog had a severe fit of coughing and the lung was lacerated, causing pneumothorax.

Bronchial Asthma; Asthma.—Under the general term of asthma we understand dyspnœas, accompanied with continued cough and labored spasmodic breathing. The true spasmodic asthma, as described in man, in which there are acute attacks of spasmodic respiration, can hardly be said to occur in the dog. Temporary dyspnœa occurs in heart disease, nephritis, and some other affections. In a restricted sense, asthma or bronchial asthma, as we designate the disease in man, is characterized by attacks of acute dyspnœa at irregular intervals, caused by temporary spasmodic contraction of the bronchi, with distention of the lungs without evident anatomical changes being the cause. While it was once generally thought that asthma was a pure neurosis (bronchiale neurosum), the inclination of the present day is to believe that in the majority of cases reflex action from the nasal mucous membrance (according to Strümpel) is one of the chief causes. The attack generally begins by constant sneezing, nasal discharge, and drawing inhalation with great effort as if the nose was entirely filled; care must be taken not to confuse this condition with congestion of the turbinated bones or nasal polypus.

Many think that it is doubtful whether asthma in the above sense ever really occurs in the dog. As a rule attacks of asthma with dogs refer to chronic bronchitis or conditions following as a result of the chronic bronchitis, or to heart failure.

Neo-formations of the Lung.—With the exception of tubercular alterations, changes in the lungs are exceeding rare. Carcinomas may occur, generally associated with carcinoma of the thyroid or the mammary glands; these appear in varying sized nodules in the lung tissue; those attached to cartilaginous layers of the bronchi grow to quite a large size. Sarcomata, less often Chondromata and still other tumors may occur. Chondromata come from the cartilaginous rings of the bronchi and under certain conditions may attain an unusual size. The clinical symptoms in the early stages of these formations are not very pronounced and rarely observed, but may present symptoms similar to chronic affections of the lungs, such as chronic bronchitis or interstitial pneumonia. There may be difficulty in respiration, œdema of the head and neck, due to pressure on the jugulars, or difficulty in swallowing due to pressure on the œsophagus. in isolated cases repeated nosebleeding was observed. Frohner found one case of carcinoma of the lungs where the animal had frequent hemorrhage. Treatment is useless. Parascandolo, keeping up artificial respiration, removed a carcinoma through the chest wall from a large dog. It is of importance in diagnosing, to be able to add to the above symptoms evidence of the existence of a primary tumor.

DISEASES OF THE PLEURA

Inflammation of the Pleura; Pleurisy

(*Pleuritis.*)

Etiology.—The disease is divided into two forms—primary and secondary pleuritis. The **primary** form may be caused by cold, which, however, must be looked upon certainly only as a predisposing factor, while the actual cause may occur as a metastasis, or from the presence of certain bacteria in the blood, which find a favorable nidus in the pleura, lodge there and set up pleuritis. The **secondary** form results from traumatic causes, such as animal being kicked, struck, stepped on, or receiving a violent blow on the thorax, penetrating wounds on the thorax, etc., also from the extension of inflammations from the surrounding organs, as gangrenous pneumonia, pericarditis, or from peritonitis extending through the diaphragm, fractured ribs, or sternum injuries to the walls of the thorax, or perforation of the throat by foreign bodies. We also see it in all forms of pyæmia, septicæmia and tuberculosis. Cadeac thinks that in nine out of ten cases of septicæmia following serous or fibrous pleuritis in the dog, it is of tubercular origin. Tumors of the pleura, chronic nephritis, and acute articular rheumatism may also develop pleurisy. Piana found bacilli and Hutyra and Marek found it caused by streptothrix (actinomyces) canis.

Pathological Anatomy.—The pleura is clouded, lusterless, severely injected, rough on the surface with a veil-like, thin or heavy, skin-like or matter fibrin-coating. If at the same time no fluid at all or very little is present in the thoracic cavity we refer to it as a pleuratis fibrinosa s. sicca, which may appear and remain circumscribed. Usually, however, the exudation collects rapidly in the thoracic cavity (pleuritis exudativa). This fluid pleuritic exudate may be serous, serofibrinous, streaked with blood, purulent or ichorous. The exudation which collects rapidly crowds the lung of the affected side and finally presses it against the spinal column and mediastinum, pressing the lung into an inert mass (lung atelectasis). The opposite lung is the seat of considerable collateral hyperæmia, which may lead to œdema, according to the severity of the condition. When a large quantity of exudate and the compression of a lung is continued for any length of time, the affected alveoli lose their functional activity, their walls collapse and become adherent even if the fluid exuded finally becomes absorbed. After this has occurred or the exudate has been removed by an operation or been absorbed the reduction in the size of the affected half of the thoracic cavity can readily be recognized from the outside by the depressed appearance of the ribs. This appearance may also appear as a result of contraction of connective tissue growths between the lungs and costal wall.

In cases of primary pleuritis which have been seen by the writer, the inflammatory process was always restricted to one side, and that, as a rule, was the left side. The cases of secondary pleuritis were generally double-sided, but the inflammatory conditions are never of equal intensity on both sides, one side being always a little worse than the other. Besides having the results of pressure shown on the lungs, we also find the heart is pushed toward the healthy side of the mediastinum or the diaphragm.

The conclusion of pleuritic inflammation depends on the intensity and duration of the disease and the character of the exudate. In favorable cases the latter is reabsorbed and good results follow. In serious cases, only the liquid portion of the exudate is entirely or almost completely absorbed, while a fibrinous exudate covers the pleura; this becomes converted into a granular tissue containing numerous vessels and later into a stringy cicatricial tissue, called a pleuritic sward, with more or less adhesions of the pleura between the lungs and inner wall of the thorax and between the lungs and diaphragm. Although the sward formations may be very extensive, it is possible for the lung to regain its normal extension, but this takes a long time. Thin adhesions sometimes tear; and extended adhesions offer a constant hindrance to the unrestricted use of the affected part of the lung. Purulent exudates are very rarely reabsorbed; but, as a rule, if the pus is not removed at the proper time by surgical interference it breaks out, either through the pleura into the lungs and then through the bronchia, or it appears outwardly by forming an abscess somewhere in the cavity of the chest, generally in the region of the sternum, by undermining the pleura and muscles of the chest.

Clinical Symptoms.—In the primary form of pleuritis, when its origin is from cold, etc., it is ushered in with a rapid rise in temperature, the pulse increases in frequency, and at the onset the animal generally has a chill; the temperature remains high, "not as high as at first," and generally runs a decided atypical course. The pulse, with rare exceptions, remains very frequent and during the continued course of the disease it usually is small, weak, and thready. Primary pleuritis with purulent or putrid effusions is rare, and when it does occur it is always accompanied by a high remittent fever.

The general health is very much disturbed. The animal is slack or sometimes stiff and sore on moving about; has little or no appetite, but intense thirst, at least as long as the exudate increases. The visible mucous membranes are reddened and congested, and in cases where there is much exudation, the membranes are dark bluish-red. The fæces are generally scanty, dry and hard. The urine presents some symptoms that are diagnostic; for instance, while the exudate is forming and collecting, the urine is scanty and thick, lacking in chlorides, and often albuminous in reaction. When the exudate is commencing to be reabsorbed the urine increases very much in quantity and is very clear or whitish-yellow (see chapter on Examination of the Urine).

There is also marked dyspnœa. In dry pleuritis the respiration is superficial and rapid, and where there is great exudation the respirations are short and painful, sometimes blowing with distended cheeks and showing a forward and backward movement of the rump. Upon pressure on the affected chest wall, especially upon the intercostal spaces, the patients evince pain by moaning and retreating and lie down upon this side.

If during the examination the animal is placed on its healthy side the respiration increases and lack of breath threatens choking and the animal has all the symptoms of smothering. A characteristic symptom is the way the animal endeavors to assist respiration by assuming a sitting position with the front legs spread out as far apart as possible and using the abdominal muscles, with show of pain on pressure of the abdominal muscles of the affected side. The animal has a soft, dry, weak cough; this may, however, be absent.

The physical symptoms are characteristic. Upon inspection of the thorax the changes in form mentioned previously may be recognized. On percussion at the outset of the disease there is, besides the contingent utterances of pain and the cough, little change of sound, but when the exudate has reached a certain height, the lower parts of the chest give a dull sound and upon still greater exudation an empty sound which seems to be limited in a straight line, according to the position of the animal, i. e., always located in the deepest (lowest) part of the thorax.

The decided feeling of resistance upon percussion is also characteristic of pleuritic subdued (dull) sounds. Above the exudation the sound is tympanitic on account of the retraction of the lung. At the beginning of pleuritis the auscultation may be made very difficult by a dull muscular bruit caused by a trembling of the intercostal muscles. Auscultation gives a friction bruit in the onset and only rarely are these bruits audible above the region of the exudation even when exudation increases and when the fluid begins to be reabsorbed and the pressure of the exudate against the lungs is lessened, the respiratory bruit is altered. In the earliest stages of the disease the sounds are vesicular, but as the exudate collects the sounds become indistinct or blowing and finally only bronchial, and when the bronchial tubes are affected the sound is lost entirely. Above the exudate the breathing almost always sounds more or less like blowing. In the healthier parts of the lungs we find increased vesicular breathing.

In very severe cases the sounds of œdema of the lungs are heard. Displacement of the heart by the pleuritic exudation is of importance since, for example, in pleuritis on the left side, the heart beat on the left side disappears and can only be felt on the right side. In case of doubt an exploratory puncture is advised. The symptoms described above apply essentially to exudative pleuritis. A mild case of pleuritis sicca may occur with no symptoms that can be recognized by the owner of the dog; a severe case is characterized by rapid, difficult respiration of the abdominal type, rigid position of the body, pain upon pressure on the intercostal spaces pleuritic friction bruits and fever.

Course and Prognosis.—Primary pleuritis is generally slow in its course unless it is removed in an operative way; the time taken by the exudate to become reabsorbed is very long, except in very vigorous, young animals, where instances have been observed of a rapid absorption of the exudate and a complete, permanent restoration. When the exudate commences to be reabsorbed the percussion sound becomes less dull in the upper regions of the subdued (dull) sounds and the respiration bruit more distinct, gradually again assuming its normal character —while the respiration at the same time visibly grows freer and easier, and if the exudate becomes quickly reabsorbed, the diseased side, at the same time of greatest amount of exudate, often appears distinctly widespread but may with continued reabsorption result in a noticeable condition that is lessened in circumference, or it can be better described as being flatter. This flattening or contraction may gradually adjust itself, but under certain conditions may remain permanent.

Death may occur during the critical period of the disease by collateral hyperæmia and œdema of the non-affected sections of the lungs, by carbon-dioxide poisoning, from defective function of the lungs, by total stagnation of the circulation of the blood, from pressure of the exduate on the large blood vessels and the heart, or later on by exhaustien and by secondary diseases. To this class belongs dropsy caused by stagnation of the blood circulation, from weakness of the heart, and amyloid degeneration of the kidneys, liver, or spleen. Death may also occur from complicating diseases, such as bronchitis and lobular pneumonia. The prognosis depends upon the intensity of the symptoms and the kind of pleuritis.

The prognosis is generally favorable; as a rule, very severe cases of primary pleuritis make good recoveries, depending largely on the animal and character of the exudate and the reabsorption of the lymph, and there may at times be adhesion of the whole or part of the pleuritic surfaces, or irreparable consolidation of the lungs—conditions that often result in the animal remaining asthmatic permanently. In secondary pleuritis the prognosis depends on the original disease. Purulent, ichorous, usually also hæmorrhagic exudates must be judged as being unfavorable.

Therapeutics.—The treatment of secondary pleuritis is the same as the primary, but in the former we must take into consideration the treatment of the original disease. In the early stages of the disease, when the exudate is collecting, we must apply counter-irritants, such as liniments or plasters of mustard (1:25-40 spirits of olive oil), also volatile liniment of Croton oil (1:50-75), later Priesznitz compresses or an alcohol compress (with spiritus dilutus), while others recommend a cooling treatment in the form of cold-water, or ice compresses followed by rubbing with sharp liniments only after the exudate has remained at its highest point for several weeks. No importance need be attached to moderate fever; high fever is to be combatted with salicylic acid preparations (sodium salicylate, aspirin), salipyrin, antipyrin or lactophenin. Large doses of antifebrin (acetanilid) can be dangerous to highly feverish, weakened dogs. When a copious exudate has been formed we try to induce its reabsorption by stimulating the kidneys by means of acetate of potassium, acetate of sodium, with the Priessnitz compress. When the heart is weak we use digitalis and squills. Small doses of calomel are also useful, but if administered steadily will weaken the patient greatly (for this reason, the powders of calomel and digitalis, mentioned below, should be administered only during a limited period of time). Drugs that increase (or produce) the flow of saliva are also recommended, e. g., pilocarpin, which should, however, only be used in case of completely intact lungs and a sound heart. It is, of course, understood that care must also be exercised in administering digitalis and the possibility of a cumulative effect kept in mind. In later stages, especially in the formation of pleurtic indurations and adhesions, iodine containing compounds are prescribed internally and on the chest wall.

℞. Hydrarg. chlor. mitis, 0.03
Digitalis pulv., 0.05
Saccharum lactis, 0.5
M. et fiat pulv. No. vi.
Sig.—One powder three times daily.

℞. Acid. acetylosalicylic
Sacchari āā 0.2
M. et fiat pulv. D. tal. dos. No. vi.
Sig.—One powder mornings and evenings.

℞. Tartar. depurat 20.0
Succ. Juniper, inspissat. 50.0
Sig.—A heaping teaspoonful every four hours.

Diuretics and cardiac stimulants have only an indirect influence on the accumulations, and when the exudate is gradually absorbed one can hardly credit these drugs with accomplishing the results, as the exudate is usually reabsorbed, when the acute inflammatory stage of the disease has passed. The best method of treatment is the removal of the secretion by surgical means, that is, by puncturing the chest wall. This operation is not at all dangerous in the dog, and is generally successful, unless the adhesions are too thick.

The operation must be performed when serious disturbances in the activity of the heart and lungs appear and when there is a very large exudate and the dull sound can be heard over the entire lung, that is, where there is œdema of the lung and intense dyspnœa caused by the pressure of the exudate; or where there is deficient reabsorption as is seen where the fever has entirely disappeared and the fluid does not show any signs of becoming reabsorbed. At other times the puncture is not performed until after the first severe symptoms of the disease, especially the fever fluctuations, have passed. It is to be remembered, however, that because of the lungs being compressed over a long period may forever cause them to lose their elasticity and that the puncture performed soon after the appearance of fluid exudate often results in a quick recovery.

Puncture of the Cavity of the Chest.—This must be on the side where the exudate is highest; this can be detected by auscultation.

The trocar used in this operation is an ordinary sized thin trocar, seen in Fig. 88, or, if we wish to make first an exploring puncture, we use the needle of the ordinary hypodermatic syringe. The needle, after having been disinfected, is introduced into the lower third of the wall of the chest (also previously disinfected), in any of the interspaces between the fifth and ninth ribs, usually between the sixth or seventh ribs, the patient being in a standing position or laid on a table and held by means of an assistant. If towards the end of the puncturing the outflow grows slow the patient should be bent slightly forward if necessary. The entrance of air into the thoracic cavity must be avoided, and to prevent this we must use a trocar that has a faucet fastened to it or else a rubber tube through which the fluid is lead into a basin containing sterilized water, or else where we use the ordinary trocar and canula when the flow of the fluid becomes stopped at any time from some obstruction at the end of the trocar, it is well to put the finger over the end of the opening to prevent the air from being sucked into the cavity. When the pulse is affected or when animal coughs violently the trocar must be withdrawn or the finger kept on the opening of the trocar or when the fluid becomes bloody or the point of the trocar is felt resting on the pleura. It is well to empty the cavity slowly and with interruptions in cases as just mentioned and never entirely, as the two faces of affected pleuræ coming in contact with each other and rubbing often causes acute hemorrhage. After withdrawing the trocar it is well to paint the opening with some iodoform collodion.

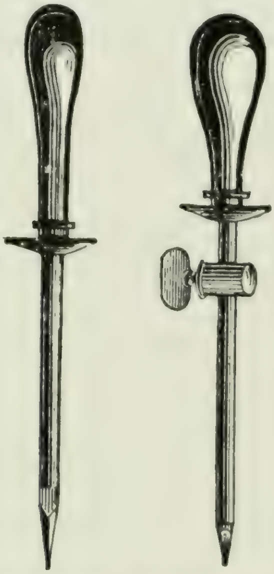


Fig. 88.—Trocars for puncture of the thorax.

When the fluid obtained is purulent, or particularly if it is ichorous, it generally requires several punctures to empty the cavity. However, merely the removal of the exudate in this case does not lead to a permanent cure even if followed by the injection of Lugol's solution or other disinfecting fluids. If the treatment is to be carried further nothing remains to be done but thoracotomy with resection of a rib. Further information concerning this treatment will be found in special books. The animal should have a nutritive but easily digested diet —soup, beef tea, or lean meat, and when the fever is high, antipyrine in doses of 0.5 to 2.0, according to the size of the dog.

Dropsy of the Chest

(*Hydrothorax.*)

Any accumulation of serous fluid that is not dependent on an inflammation of the pleura (that is, of a transudate) in the cavity of the thorax, is called hydrothorax. This is often a symptom of general dropsy or it may arise from chronic disease of the heart, lungs and kidneys and in severe anæmic and cachectic conditions (see ascites). In such cases the effusion first shows itself in the chest when dropsy of the skin (anasarca) exists, or less often as a result of disturbance of the venous system, particularly of the portal. Most frequently, however, it appears only at such a time when ascites and œdema of the skin already exist.

Pathological Anatomy.—Hydrothorax, as a rule, affects both sides of the chest at the same time. Frohner records a case where one side only was affected. The fluid in the two thoracic cavities does not always reach the same height. We find in the cavity of the chest, a clear, or a very slightly turbid, pale red or yellow fluid, sometimes stained with blood and distinguished from a pleuritic exudate by the absence of fibrin, by very little cellular elements, little albumen, and by a low specific gravity. The pleura is œdematous and swollen, and in long-continued cases it has a flaccid or macerated look. The lungs do not present any change except the signs of partial compression. The other organs of the body are anæmic.

Clinical Symptoms.—The physical examination of this disease presents symptoms very simlar to pleuritic exudates, but the change takes place quickly, and fever and cough are absent, but in dropsical transudates both sides of the thoracic cavity are filled, while in pleuritis generally only one side, and on changing the position of the animal the fluid moves about much more quickly than a pleuritic exudate would, and the sensitiveness of the animal to pressure on the walls of the chest and the rubbing or crepitating bruit of pleuritis is absent, in addition, demonstrating the nature of the primary disease and in cases of doubt resorting to the exploratory puncture.

Therapeutics.—The treatment, as a rule, is of a palliative character, and must first of all be directed against the original or primary disease as it is only in very rare instances that we succeed in removing the original disease; but we may use the same agents as in ascites. The first steps to counteract the exudate consist in a removal of drinking water (or other fluids) as much as possible and administering diuretics of which digitalis and the previously named purin-substances (coffein, theobromin, theophyllin) are to be mentioned; all other drugs that stimulate the kidneys, and under certain conditions calomel and pilocarpin, can be used. Digitalis should only be prescribed when heart trouble is recognized as the cause of the hydropic condition. The operation of tapping the chest wall (see puncture of the cavity of the chest, page 150) is only to be resorted to when the fluid has collected in large quantities and the animal is threatened with suffocation; but this only affords temporary relief.

Other Diseases of the Pleura

Pneumothorax.—*Etiology.*—The cause of pneumothorax, that is to say, the accumulation of air in the thorax, is produced in several ways; by perforating wounds of the chest, by the breaking into the pleural cavity of a collection of pus from the lung, or by a purulent or ichorous accumulation of pleuritic exudate breaking outwardly or into a bronchus, by tearing of the lung tissue from great traumatism, and from perforation of the œsophagus or pharynx. Careless puncture of the chest wall, fracture of ribs, with injury to the pleura of the lungs, perforation of the bronchi by a foreign body, which finds its way into that part, or it may also be caused by degeneration of the pleuritic effusion, causing the formation of gas, or by perforation of the pharynx, and by aspirated foreign bodies penetrating into the pleural cavity.

Pathological Anatomy.—On making an opening into the chest with trocar and canula, the air escapes with a hissing sound; if the collection of air is great, the lungs are pushed out of position, interfering greatly with respiration. If this condition exists for any length of time, a purulent, and, in rare cases, a sero-purulent, pleuritis is developed, caused by the presence of some irritant agents that have gained admittance into the cavity besides air. When large quantities of air penetrate into the thoracic cavity the lung contracts back against the hilus pulmonis, shrinks, becomes empty of air and no longer functions in respiration. At the same time the neighboring organs are crowded more or less out of their positions. If life continues for some time after the appearance of pneumothorax a pleuritis of a purulent, seldom of a serous or sero-fibrinous character (pyopneumothorax, seropneumothorax) develops.

Clinical Symptoms and Course.—There is sudden great difficulty in respiration, and the affected side of the chest wall is visibly distended, and during respiration it remains almost stationary. When the heart is pushed out of position there is a peculiar tympanitic sound, the pulsations have a metallic echo, and the respiratory bruit is absent. In some rare cases we hear a metallic bruit; this is caused either by the entrance of air directly through the opening into the pleural cavity with each inspiration and expiration or by the transmission to the ear of the examiner of the normal bruits that have arisen in the larynx, trachea and bronchi.

Animals in this condition generally die rapidly, although we may find rare cases where recovery takes place by an absorption of the air, or is followed by the accumulation of a fluid (pneumohydrothorax) which itself in turn becomes rapidly absorbed. The treatment consists in the administration of camphor or alcoholic stimulants and in tapping the chest wall.

Hæmatothorax.—In consequence of the destruction of some large blood vessel or vessels in the lungs or the pleural cavity through trauma by a dull object, very seldom in any other way, or from the presence of growths we sometimes find extensive hemorrhage into the thoracic cavity (Hæmothorax). The physical symptoms are similar to those of other pleural exudates, but this condition comes on very rapidly and in this condition the mucous membranes become very pale. When the symptoms are not pronounced the operation of puncture will determine the condition positively. Moderate hemorrhages are easily and sometimes quickly absorbed, but often where there is great dyspnœa, puncture of the chest wall is always advisable, but only small quantities should be drained at a time. Later on, the subcutaneous or rectal injection of a physiological solution of sodium chloride may be undertaken. If the hemorrhages are not reabsorbed, pleurisy will result.

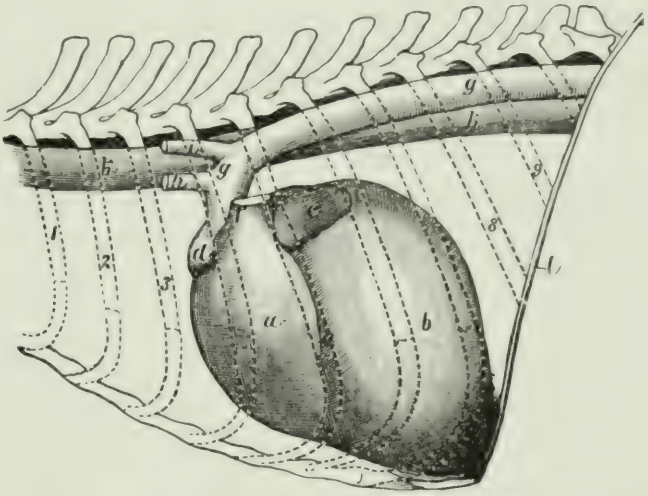


FIG. 89.—The heart in position: *a*, right ventricle; *b*, left ventricle; *c*, left auricle; *d*, right auricle; *f*, pulmonary artery; *g*, aorta; *k*, œsophagus; *l*, diaphragm.

Other Pathological Conditions of the Pleura

Besides tubercular deposits we find endothelial papillomas which are seen in the form of velvety or grape-like formations on both sides of the mediastinal coats of the pleura and on the pleuritic coat of the diaphragm. These formations frequently cause a low form of chronic pleuritis (Kitt). The writer has observed an intrathoracic chondroma of great size, which was attached to the ribs, filling up the left thoracic side (the heart beat was felt in the middle at the right chest wall), and pushing the left lung and heart to the right side. There was severe dyspnœa and anasarca.

DISEASES OF THE CIRCULATORY APPARATUS

EXAMINATION OF THE CIRCULATORY APPARATUS

Examination of the Heart

Anatomy of the Heart.—The normal position of the heart may be seen in Fig. 89. It lies on the left side, but not so far as is seen in other domestic animals. The direction of its axis is not vertical, but extends slightly in a posterior direction, with a slight curve toward the left side. The base of the heart extends from the third intercostal space to the seventh rib; the rounded apex extends backward toward the diaphragm, in the niveau of the seventh or eighth costal cartilage, depending upon the position of the diaphragm which is determined by the breathing. Superiorly the heart lies close to the large vessels—the trachea and the œsophagus—and close on all sides to the lobes of the lungs. In its outermost parts of the lateral sides only, it lies close to the chest-wall, the surface touching on the left, extending from the third or fourth rib to the sixth or seventh intercostal space, and the right surface touching the chest wall only in the region of the fifth rib. In the heart-sections we find the following arrangement: the right half section lies in a right anterior direction from its axis and the left lies in a left poster direction, and in each half the auricle lies on the respective ventricle.

The size of the heart varies greatly in different animals, even in animals of the same breed and even when in a normal condition, and it is, therefore, impossible to lay down any relative rule as to its size or dimensions. According to Colan, the weight of the heart compared with that of the body is 1 to 90; and according to Rabe, it varies from 1.4:100, and taking relatively all the breeds of dogs, and also of sex and age, the relative size is 0.8 and 2.2 to 100.

The larger hearts are to be found in hunting and draught dogs. Zschokke fixes an average weight of the heart of normal dogs at 0.87% of the body weight (1.1% in hunting dogs, 0.52% in fox terriers). According to Schubert the heart filled with coagulated blood weighs 40-670 g. (a mean of 232.6 g) of 0.9-2.2% (a mean of 1.3%) of the body weight, the emptied heart 29-493 g. (a mean of 176.5 g.) 0.85-1.4% (a mean of 1%) of the body weight. According to Schubert the heart of smaller dog is relatively lighter in weight, but if the relation of the heart to the length of the body is taken into consideration then it is relatively heavier than the heart of the larger dog.

It is difficult to make an examination of the heart on account of its position, lying as it does hidden between the lobes of the lungs, with only a small portion of its surface exposed where it can be heard, and from the fact that it varies in size not only in the various breeds, but also in individuals. We find that in animals affected with the various heart affections and also in perfect health the pulmonary bruit may be so increased that it is impossible to detect when there are weak heart sounds, as the largest portion of the heart is covered by portions of the lungs, and as these parts also make sounds the ears cannot detect the sound. The restlessness of the animal during examination and the movements of the cutaneous muscles and the coat of the animal are all factors that assist in preventing a proper examination of the heart.

The following details must, therefore, be looked upon to a certain extent as theoretical in character.

In making an examination of the heart we must consider the position and size of that organ, its palpitation sounds, and character of the pulsations.

Position and Size of the Heart.

Both are to be detected by percussion, but for the reasons above explained it rarely answers our expectations. In percussion over the position of the heart with the animal standing, we find in normal conditions a dull sound which lessens in deep respiration, decreasing the area of the sound about one half. With medium inspiration a comparatively narrow, rather horizontal area of dull sound (heart dullness) can usually be located on the left side over the sternum, approximately between the fourth to sixth or seventh costal cartilage. On the right side, the area of the dull sound during medium inspiration is somewhat shorter and reaches from about the fourth to the fifth or sixth costal cartilage. The position, either standing or recumbent, may make a decided difference. If the animal stands upright on its hind legs the anterior boundary may be moved downward into the fifth intercostal space. In small dogs the areas of dullness can often be detected only with difficulty and not always with certainty.

In animals having a small heart, the sound if often entirely absent. The sound of that section of the lung that lies between the heart and the chest wall is also a factor that makes the sound dull, and it is only by strong percussion that any sound can be detected at all, so that it may hardly be said to be of much diagnostic value.

Also the percussion of the heart from the region of the sternum, which can be done with the animal when standing upon its hind legs, gives no characteristic dull sound for the location or size of the heart.

The percussion is done first with the animal standing and the shoulder region is limbered up as much as possible by pulling the shoulders forward and sideways. Of the various methods in vogue, percussion with the fingers is given the preference for small and medium large dogs.

There may be increases in the sound of dullness in the heart's action in hypertrophy, in dilatation, in exudates and transudates around the heart, in expansion and thickening of the pericardium by sarcomatous or carcinomatous tissue growth, and in retraction or contraction of the lobules of the lung surrounding the heart; but we may often be deceived by abnormal processes that surround that organ, such as thickening of the lung sections or swards on the pleura. The dull sound is lessened in enlargement of the lungs by emphysema and is absent in pneumo pericardium (when air has entered the pericardium) after injuries, in one-sided pleuritis and in pneumothorax, and is absent in pneumothorax. In pneumopericardium a tympanitic, sometimes a slightly metallic percussion sound can be located in the region of the heart. Furthermore the heart sound may be moved or disappear entirely by all factors that result in a dislocation, etc., of the heart beat (see below). Utterances of pain during percussion of the region of the heart can be observed during the first stage of pericarditis and pleuritis. If the pain is left only in the region of the heart it denotes the beginning of pericarditis. The sound is anteriorly situated in the chest when there is intense meteorization of the stomach or intestines, and in ascites.

Character of the Heart Pulsations

The pulsations of the heart can be distinguished by putting the flat hand on the inferior portion of the chest near the sternum, about the fifth rib (on the right side the pulsation is situated a little more anteriorly). Upon closer examination the heart pulsation can be felt on the left side in the fourth to sixth intercostal space, on the right side in the fourth to the fifth, and as a rule most distinctly in the fifth intercostal space on the left side, and in the fourth on the right side. The pulsation makes a distinct vibration of all the adjacent parts, and in emaciated short haired animals there can be noticed with each pulsation a distinct rhythmic swelling or motion of the lower portions of the ribs and muscles, on the left side the muscles in the middle of the fifth intercostal space, on the right side in the middle of the fourth. Generally the heart beat is always stronger on the left side than on the right under nomal conditions. This vibration may be greatly lessened or even made almost imperceptible on both sides by the presence of layers of fat on the sides of the chest. After great exertion or excitement, such as joy, fear, fright, etc., the strength of the pulsation against the chest wall is greatly increased, and by a change of body position the location of the heart pulsation is altered.

The pulsations of the heart are affected by diseases in the following ways: After considerable loss of blood, in any case of fever of long duration (the pulse is weak), in palpitation of the heart, in some forms of heart disease that resulted in a weak heart, in hypertrophy of the heart (the pulse is very strong), in dilatation of the heart, or by the influence of some poisons, such as digitalis or aconite, and in case of thickening and contraction of parts of the lungs lying above the heart. It is almost imperceptible, or entirely so (on both sides), in degeneration of the muscle of the heart, especially during the course and in the later stages of acute diseases, in certain cases of poisoning, in fatty degeneration of the heart, in many cases of brain diseases and when the heart has become compressed by both thoracic walls through bilateral pleural exudates or by hydropericardium, pneumopericardium, possibly by a hernia diaphragmatico—pericardialis, which has been observed several times in dogs—in case of compression of the heart and a growing together (adhesion) of the pericardium with surroundings, and by the effects of hydrothorax, or emphysema of the lungs. It is distinguished only on the healthy side in unilateral pleural effusions, lateral pleuritis, pneumothorax, tumors on one side only, etc., whereas the reverse is true, the pulsation being felt more on the diseased side, in case of a unilateral contraction of the lungs and in case of a decrease in size of one side of the chest after pleuritis has run its course. A congenital displacement of the heart towards the right side (dextrocardia) is considered very rare. A displacement of the heart pulsation anteriorly may be caused by the development of a large quantity of gas in the stomach or intestines, Hydrops Ascites, perhaps also large tumors of the liver, a displacement posteriorly by intrathoracic tumors in front of the heart. A wave-like (rhythmic) tremor of the region of the heart without a detectable heart pulsation is sometimes observed in pericarditis accompanied by severe exudation. Irregularities in the strength and frequency of the heart pulsations coincide with those of the pulse (see later).

Character of the Heart Sounds and Bruits

In order to distinguish the heart sounds we must put the ear close to the side directly over the heart where the beats are loudest; that is, about in the middle of the lower third of the chest, on the left side in the region of the fourth to sixth rib and on the right side in the region of the fourth to fifth rib; it is better to cover the place with a handkerchief or cloth, or we may use a stethoscope. The animal may be standing, sitting or lying down. Certain difficulties present themselves in case of dogs that are greatly excited and breathing rapidly, in which case the sounds of respiration conceal more or less the heart pulsations.

We should hear two sounds in each heart beat—a systolic, which corresponds to the ventricular contraction, and a diastolic, which corresponds with the beginning of the diastole. Both these sounds follow each other with short intervals between. The pause between the first and second sound is short, but between the second and the next first the sound is much greater. The first sound is a mixed muscular and valvular sound of the mitrals and tricuspids, and the second is entirely a semilunar valvular sound. The first sound appears duller, deeper, louder, the second lighter, higher, less loud and is shorter than the first.

so that both tones, according to Geigel can be imitated by the syllables "dome-lopp." They are audible, as previously mentioned, on both sides under normal conditions even though they may be stronger on the left side than on the right. Furthermore, considering the anatomical location of the heart of a dog, it may be taken for granted that in the first as well as second heart beat the left-sided portion will appear to predominate on the left wall of the chest and the right-sided portion will predominate on the right wall.

According to Marek the tone of the left ventricle shows the greatest intensity on the left in the fifth intercostal space above the bisecting line of the lower third of the chest; the second aorta sound in the fourth intercostal space directly below the shoulder line; the second pulmonal sound in the third intercostal space immediately on the margin of the sternum and not much weaker on the opposite side at the same height; the sound of the right ventricle on the right side in the fourth intercostal space at about the height of the costal groove or a little below.

Unfortunately these sounds are indistinct and incomplete in the dog, even in perfect health. In very fat dogs we may not hear any heart sound, or we may only hear the first one, and often have to resort to the use of the stethoscope to get these results. Irrespective of this, the heart pulsations can be heard, even though they are weak, through the shoulder and upper arm muscles, if the animal and environment are quiet; and in case of necessity the auscultation of the heart can be carried out from the lower portion of the chest. Auscultation on the fore part of the chest makes a clear distinction of heart pulsations almost impossible because of the tracheal, etc., respiratory sounds. In well-fed dogs it is not rare to hear the first sound, which is a great deal louder than the second, only on the left side. In thin animals we can hear the sound distinctly on both sides. With the respiratory bruit we lose to a certain extent the full strength of the sounds, and often only the first sound is heard. After great activity the heart's action is increased so much, and the sounds follow each other so rapidly, that it is impossible to distinguish one from another. In such cases the circumstance is of importance that the first sound occurs with the heart beat and that the pause between the second and the next first sound is greater than the one between the first and second.

In pathological conditions both the heart sounds may be increased by increased heart action due to a number of causes, as in the beginning of certain fevers; but generally it is an indication of hypertrophy; also in case of anæmia as well as in induration and contraction of the section of the lungs located above the heart. A lessened heart sound is found in any heart weakness, as in fatty degeneration of the heart muscle, in accumulations of exudates around the heart in the pericardium or pleura, or in emphysema of the lung sections, or in intrathoracic tumorous masses, etc. In such cases, as a rule, the second heart sound is often almost imperceptible.

An unusual tone of the heart sounds (metallic tone) is often heard in anæmic animals; split or doubled heart sounds which are generally caused by the contraction of the separate divisions of the heart neither beginning nor ending at the same time are found occasionally in normal, healthy dogs.

As can be readily seen, it is by no means always easy to hear the heart beat distinctly in its normal condition, and the condition becomes more complicated when we have to distinguish pathological sounds—"heart bruits." We distinguish between endocardial heart bruits, which originate in the heart direct, and pericardial heart bruits, which come from the arterial part of the heart and its envelope. The former are divided into organic and inorganic bruits, depending upon whether they are caused by anatomical changes or not. The organic heart bruits are produced by stenosis (contraction) of the ring and by insufficient or imperfect closing of the valves, which may occur either in systole or diastole, making the heart sound indistinct, or it may be entirely absent, and the bruit takes the place of the heart sound. The systolic bruit is buzzing, hissing, sawing, scraping, or blowing in character, and indicates an imperfect closing of an auriculo-ventricular valve (in most cases of disease of the mitrals, less often the constriction of an arterial osteum). The diastolic bruit is rushing or wheezing in character, and indicates a stenosis of the auriculo-ventricular ostia, or the imperfect closure of a semilunar valve. The inorganic heart bruit is seen in all forms of anæmia, and occasionally in fevers. These bruits are weak, soft breathing-like, often temporary and often disappear with the movements of the body. They play a very subordinate part. Pericardial bruits are very similar to pleuritic friction sounds, that is, a scratching or scraping sound. They are located in a sharply defined locality and do not occur in direct rhythm with the heart sounds, but seem to occur between them. They are noticed in pericarditis as soon as there are any fibrinous deposits present and there is not sufficient pericardial fluid present to keep the pericardial folds free from contact with the heart. They may occasionally be caused by pericardial tuberculosis or sarcomatous tumors. A change in the position of the animal makes quite a difference in the character of the bruit, and it may easily be distinguished from endocardial sounds. The pericardial friction sound is distinguished from the pleural friction sounds by the fact that it is entirely independent of the movements of respiration (holding the mouth and nostrils shut, irritating to cause coughing).

The exploratory puncture of the pericardium should be undertaken only in exceptional cases and would be made similarly to the puncture of the thoracic cavity (described previously). The puncture is usually made on the left side in the fifth or sixth intercostal space, several centimeters above the sternum. Bucher recommends the puncture of the pericardium to be made on the left side near the cranial margin of the seventh or fourth costal cartilage about in the middle between the costal symphysis and the ventral thoracic margin, somewhat dorsal from the lateral margin of the M. pectoralis profundus or of the M. rectus abdominis. The puncture should be made during expiration to avoid injuring the lung. Information has been given previously concerning the determination of the puncture fluid.

Character of the Pulse

It is taken for granted that the technique of taking the pulse is understood. The pulse is best examined in the femoral artery (Arteria femoralis), inside of the thigh, and it may be felt also in the radial artery (Arteria brachialis) inside of the forearm, above the elbow joint or in the Arteria saphena just above the hock joint between the Achilles tendon and the tendon of the deep flexor. According to Jakob the latter should be used in very heavy dogs, in case of muscle hypertrophy of the adductors of the upper part of the thigh as well as when the brachial artery cannot be used for some reason, for example, when tumors are present in the region of the upper arm and elbow. The coccygeal artery is not suitable. The pulse is usually counted (the animal of course to be kept quiet) for one-half minute, then the number obtained is multiplied by two to secure the frequency per minute. In case of an irregular pulse the counting must be continued for at least one minute. If the animal is frightened or excited it is advisable to wait until it has been quieted before making a deciding count. In the examination of the pulse we must take into consideration its frequency, its cadence, and its quality.

The normal pulse varies greatly, according to the breed, age, and size of the animal, and is rapidly increased from such causes as physical efforts, fear, fright, pleasure, high outside temperature, etc. Similarly pregnancy affects the pulse; frequency gradually increases from the middle to the end of the period of pregnancy, while the influence of digestion seems to be very insignificant. The general pulse is from 70 to 120 pulse beats per minute, in large animals being less (60-80) and in very small animals having a correspondingly frequent pulse rate (100-120). During the first week of life young dogs show an average pulse of 200 per minute—or even more. The rhythm (cadence) should be regular in a healthy animal, and physical causes make it irregular; but an irregular pulse in perfect health is very common in the dog; in fact, perfect rhythm is rare, as can be easily demonstrated by taking the pulsations frequently, the irregularity being well marked in very young or old animals. It may sometimes occur in entirely healthy dogs that unequal, irregular and arhythmic pulse beats happen together and then as a rule, the pulse beat that follows the longer pause, will be the greater beat. Such an arhythmic and unequal pulse can usually be made to disappear in healthy dogs by rapid movement of the animal.

In normal conditions the pulse must be similar in both thighs. We find a lessening in the pulse in some forms of poisoning, especially of digitalis, strophanthus and related substances, following hemorrhages, in affections of the muscle of the heart, in starvation, diseases of the brain, that are accompanied by great depression in uræmia, in meningitis, in hepatogenous icterus, also in collapse and in diseases characterized by a continued high temperature.

And increase of the pulse is found in all fevers, in cases of valvular defects, in heart weakness and paralysis or collapse of that organ from continued high fever, also in anæmia, leukæmia, hemorrhages, in most valvular troubles of the heart, painful conditions, etc. Furthermore, large accumulations of fluids in the thoracic cavity or pericardium, tumors in the vicinity of the heart, meteorismus of the stomach or intestines and still other conditions in the thoracic and abdominal cavities may cause an increase of the pulse. When the temperature decreases, the pulse rises. The pulse is irregular (arhthymic) in some diseases of the heart (in-compensated valvular defects, myocarditis) after large doses of digitalis and similar heart poisons, and in heart weakness, as it may appear in the course of various acute and chronic diseases. It is only intermittent (as a forerunner of entire irregularity) in slight cases of valvular defects, in some diseases of the brain, and in gastricism. A pulse that merely skips a beat may, as mentioned previously, be found in a normal healthy dog; as a pathological occurrence it appears under certain conditions in case of slight valvular trouble, medium heart weakness, gastricismus and occasionally feverish diseases.

The pulse is full and bounding under great physical exertion, under pathological conditions, e. g., at the beginning of fever in left-sided hypertrophy of the heart. It is weak, small and collapsed after severe hemorrhage and in enteritis, in anæmia, leukæmia, chronic nutritive disturbances, septic and pyæmic conditions, many heart diseases, as well as all diseases accompanied by weakness of the heart. In intense heart weakness and collapse it becomes thread-like and imperceptible.

The pulse may be hard in case of severe pains, peritonitis, at the beginning of meningitis, in chronic nephritis, tetanus, etc. A very small, hard pulse, as may be found in acute gastro-enteritis, is generally designated as "thready." The pulse feels "soft" in case of a weak heart; it may be decidedly rapid and skipping in left-sided hypertrophy of the heart, especially as a result of an insufficiency of the aortic valves; it seems sluggish in very old animals, also in stenosis of the aorta, as a pathological condition. The pulse is irregular especially in heart weakness, stenosis of the mitrals, aneurysms and mediastinal tumors; it may have a double beat in case of fevers of long duration and in all forms of anæmia; unequal (i. e., weaker on the one (afflicted) side than on the other) pulse, particularly after the patient has moved, in thrombosis of the femoral and axillary artery.

An abnormally strong pulsation of the arteries, which can also be identified along small arteries that usually do not pulsate distinctly, as well as upon palpation of the abdomen, on the large arteries of the abdominal cavity, occurs, in insufficiency of the aortic valves. Under such conditions so called "arterial bruits" in the form of a soft buzzing or rubbing can sometimes be heard during auscultation of the femoral artery by means of a membrane stethoscope.

The venous pulse—that is, the apparent increase in the amount of blood in the jugular at its entrance into the chest—is often seen in the dog. If it coincides with the ventricular systole (positive venous pulse) it is generally a symptom of some chronic heart affection, such as imperfect closing of the tricuspid valves, and of heart weakness. It may, however, be caused by the auricles not contracting as they should. Contrasted with the positive is the negative venous pulse which is apparent before the heart beat and depends entirely upon an overfilling of the veins and an insufficiency of their valves. Such conditions can for self-evident reasons be detected only in dogs with short, close-lying hair and thin necks.

DISEASES OF THE HEART

Acute Endocarditis; Endocarditis Verucosa; Endocarditis Ulcerosa

Etiology.—This disease is comparatively rare. Jensen reports that in the Copenhagen clinic, out of a clinic of 3,240 sick dogs, he found 13 with ulcerative endocarditis. This condition may be caused by a sympathetic irritation of myocarditis or mediastinitis, but this is extremely rare, it being caused by the presence in the blood of certain microorganisms which lodge on the endorcardium, particularly in the valves and the deeper portions between the trabeculæ, causing inflammation of the tissues. Endocarditis can be produced experimentally by the introduction into the blood of various forms of bacteria (staphylococcus, streptococcus, coccus, bacillus pyogenes, colon bacilli, etc.), particularly if the valves have been previously affected with inflammatory processes. Consequently it is very apt to appear in such diseases as distemper, septicaemia, pyemia, articular rheumatism, and in rare instances in tuberculosis; it may also follow wound abscesses, chronic ulcerated inflammations of the skin (dermatitis), and on the tip of the tail, and as a consequence of some unknown bacterial invasion, the so-called "independent" endocarditis. Fröhner and Jensen have observed an infectious malignant endocarditis.

Pathological Anatomy.—While we differentiate between endocarditis verucosa and endocarditis ulcerosa (endocarditis diphtherica, endocarditis maligna), one may follow the other. The former (the milder form) commences with the formation of various sized wart-like protuberances on the free edges of the valves and their attachments, and also on the trabeculæ and papillary muscles; the latter, the violent form, results in necrosis and tumefaction of the endocardium. This condition may cause the formation of emboli which get into the circulation, are liberated, and produce grave conditions in various organs of the body, in the verrucose forms by the transportation and spreading of pieces of thrombi or blood clots, in the ulcerous form by spreading detached necrotic tissue that is infested with bacteria. The aortic and the bicuspid valves are more frequently affected; the pulmonary and tricuspid valves, very rarely.

Clinical Symptoms and Course.—There is fever in the onset of the disease, and if there is fever present, it is generally higher than it was, through a renewed increase in temperature. The general condition is greatly disturbed, increased irregular heart action, pulse is accelerated, weak, unequal, and irregular; on auscultation the pulsation is heard and little change is noticed in the early stages before any material alteration has been made in the valves. Later, when the deposits become organized, the heart beat is muffled and the two sounds of the heart become one, or an early systole and sometimes diastolic murmurs are evident. The respirations are more or less accelerated and labored, there is cyanosis of the visible mucous membranes and with these symptoms there may be certain metastatic changes in other organs.

The course of the disease varies; in some cases, especially in the severest forms of ulcerous or septic endocarditis, death occurs in a very short time, in the majority of cases, however, the disease progresses slowly, the symptoms may increase in severity; they may decrease in severity and the animal be comparatively well for weeks, and then the acute symptoms may recur and the disease become chronic. In mild cases animals may make complete recoveries, but this is comparatively rare.

Therapeutics.—Complete bodily rest, avoid any excitement, cold compresses, such as an ice-bag over the region of the heart; where there is a small irregular pulse we should administer Digitalis, Strophanthus. or Caffeine. When dangerous symptoms appear, subcutaneous injections of Camphor, Ether, Scopolamin or Atropin. For the fever we should use Salicylate of Soda, Aspirin, Cinchona, Antipyrin or Antifebrin, Salipyrin, Lactophenin or other antipyretics.

Valvular Disease of the Heart; Chronic Endocarditis; Valvular Defects

General Notes on Valvular Defects.—By valvular defects, or heart trouble (vitia cordis), we understand such chronic anatomical alterations in the valves and openings as lead to an irregularity in the circulation of the blood, becoming apparent by visible symptoms in the pulse or general condition; but those slight valvular defects so often seen in post-mortems and never noticed during life are not to be considered.

Valvular defects appear in two forms: first, when the valves close imperfectly; second, when the openings become contracted, causing stenosis. Imperfect closure of one valve causes a certain amount of blood to flow back into the portion of the heart from which it has just come; for instance, when there is imperfect action of the mitrals or of the tricuspids in systole, part of the contents of the ventricles rushes back into the auricles, and when there is insufficient action of the semilunar valve in the diastole, a part of the blood that has been thrown into the artery returns into the chamber again.

Stenosis of one opening retards the passage of blood, when we have a contraction of an arterio-ventricular opening. At the time of diastole the blood is kept back at the entrance of the affected ventricle, and it is imperfectly filled, while in the aortic openings in pulmonic stenosis the exit of the blood out of the ventricles (Fig. 90) in the systole is retarded. In any of these conditions there is imperfect heart action; every defect of an arterial opening interferes with perfect ventricular action and a stasis of the blood in the heart results, and every defect in an auriculo-ventricular opening causes a corresponding lessening of power in the auricle, and a congestion of the blood in that particular auricle and, of course, also into the accompanying veins. For a more complete understanding the well known scheme of the blood cycle is reproduced in the diagram illustrated in Fig. 89.

An abnormal pumping of the blood in this manner would be sure to cause more or less disturbance of the entire organism, but there are certain compensatory processes in the heart itself that tend to overcome this. As a consequence of the impaired flow, not only an expansion (dilatation) takes place, but the heart muscle is worked much harder and becomes hypertrophied (compensating heart hypertrophy). We often see cases where defects of the aorta become equalized by a hypertrophy of the left ventricle, accompanied by dilatation. In valvular defects of the mitrals the stagnation of the blood occurs in the veins, capillaries, and arteries of the lungs, and as far back as the right ventricle, which becomes dilated and hypertrophied while trying to take up the extra work thrown on it. In course of time we also see hypertrophy and dilatation of the left ventricle because during diastole the stagnated blood runs in great quantities and under great pressure into it out of the dilated auricle. The left ventricle is then compelled to work with this quantity of blood, i. e., to drive it forward into the aorta and then also partly backwards again into the auricle.

These compensating processes of the heart are apt to prevent for a long time any great functional disturbance provided the heart receives its proportional nutrition. If this is not the case, as, for instance, in anæmic and cachectic feverish animals, the compensating heart hypertrophy is not present or is only developed to a slight degree, and even in cases of sufficient nutrition, due to some alteration in the coronary artery, the heart is no longer able to satisfy the demands claimed from it and tires out, and all the effects of blood-stagnation rapidly show themselves.

Etiology of Deficient Valvular Action of the Heart.—The most common causes of valvular defects that are not congenital or chronic are endocarditic processes, which are developed on the valves and take an acute course, according to the amount of the irritation, and cause a fibrous rigid thickening and cicatricial contraction of the valves. Sooner or later we find an imperfect closure of the valvular openings through cicatricial contractions and adhesions to the lobula of the valves or in their neighborhood. This condition is quite common in old dogs and may appear as a result of extreme physical exertion, of great nervous excitement, cold, articular rheumatism, distemper, and other infectious diseases, and the endocarditis develops either at once as a chronic process or represents the result of an acute endocarditis. Cardiac valvular changes are frequently seen as a result of chronic nephritis. With regard to the distribution of endocarditis to the individual sections of the heart we take for granted that the mitral valves are most frequently affected. Cadiat and Ries found out of thirteen cases, five of the mitral, four of mitral and tricuspid, two of the tricuspid alone, and one of the valve of the aorta and one mitral and aorta. Coppel found hyperplastic changes in the auriculo-ventricular valves occurring comparatively often and almost without exception in service dogs; on the other hand chronic, fibrous, inflammatory changes occurred rarely and could no doubt be traced back to infectious diseases (distemper) which they had withstood. We may also see deposits of lime salts and a contraction of the opening belonging to the affected valve. In rare cases there is heart weakness and imperfect valvular action, which may be cauesd by a dilatation of the opening, and, thus becoming abnormally distended, the valves cannot meet and make a complete closure. Atheromatous processes may also produce this condition.

General Symptoms of Deficient Valvular Action of the Heart.—The symptoms which appear at a certain time in all valvular troubles are as follows: Increase of heart and pulse action (after slight exertion it is abnormally increased); palpitation of the heart; arhythmic action of heart beats and pulse; difficulty in respiration, which occurs especially during excitement and physical exertion but occasionally as attacks; vertigo after any exertion; bodily weakness; rapid weakening during work; cyanosis of the visible mucous membranes, especially of the head; venous pulse; dropsical effusions, such as œdema of the legs, abdomen, or testicles; hydrothorax; hydropericardium; ascites; albuminaria, with lessening of the amount of urine; complications of the digestive organs of various kinds, and, finally, general nutritive disturbances, such as anæmia, emaciation, etc., and embolic processes in various organs. Upon auscultation of the heart the heart murmurs described more fully below can be determined.

Symptoms of Valvular Deficiency in One Opening; Insufficiency of the Mitrals.—The imperfect closing of the mitral valve occurs very frequently in the dog. Besides the alterations of the valves we find hypertrophy and dilatation of the left auricle of the right heart, and in the later stages also of the left ventricle.

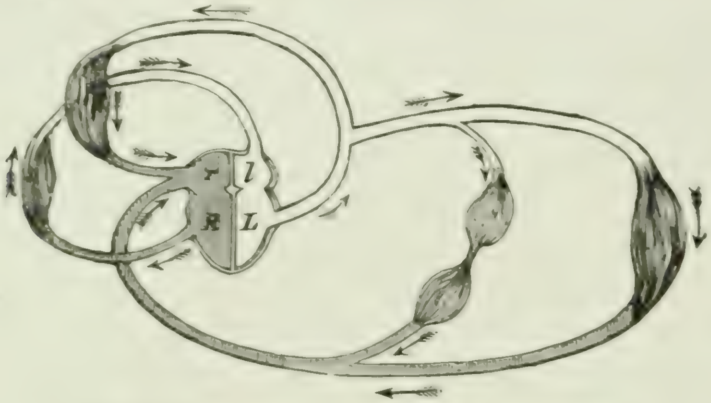


Fig. 90.—Diagram of the blood circulation.

The clinical symptoms are: Increase of the heart beat, especially on the right side, systolic bruit heard on the left wall of the chest, increase (accentuation) of the second (pulmonic) sound, in severe cases weak pulse, shortness of breath, and later dropsy, etc. Mitral insufficiencies are generally associated with chronic bronchitis.

Stenosis of the Left Auriculo-Ventricular Opening.—This is generally accompanied by mitral insufficiency. It leads also to dilatation and hypertrophy of the left auricle and the right ventricle, and in such cases the left ventricle is generally small, narrow, and contains little blood.

The clinical symptoms are: Slight increase in the pulse, diastolic or presystolic bruit (this is almost absent in some cases); considerable increase of the second (pulmonic) bruit, very small, irregular pulse; great difficulty in respiration.

Insufficiency of the Tricuspid Valves.—This insufficiency causes the right auricle to become overfilled with blood and leads to stagnation of the blood in the large veins and even beyond and can be recognized by systolic bruits, strong venous pulse, and by cyanosis of the visible mucous membranes. A stenosis of the right auriculo-ventricular opening seems to occur very rarely and would be identified by weak heart beat, decrease in heart murmurs, presystolic or diastolic bruits, weak, small pulse, venous pulse and hydropsy.

Disease of the Aortic Valves.—This condition of the semilunar valves causes a severe dilatation and hypertropy of the left ventricle and flattening of the trabeculæ and papillary muscles.

The clinical symptoms are as follows: A very strong heart beat; increase of the heart dullness on the left side, diastolic murmur, and a full, bounding, but short, quick, pulse is very frequently noticed, which may also be felt on small arterioles that ordinarily do not pulsate distinctly and upon palpation of the abdomen wherever the large arteries can be felt, there are arterial murmurs. This character of the pulse is also noticed in small arteries that in normal conditions have no distinct pulse. We also find shortness of breath, œdema, and dropsy of the dependent parts.

Stenosis of the Aortic Opening.—Rare in the dog. The left ventricle is hypertrophic but not particularly dilated.

The clinical symptoms are a systolic bruit, a very slight sound of the aorta, small, weak, long-drawn-out pulse, general anæmia, vertigo attacks, etc.

Imperfect action and disease of the tricuspid valves cause distention of the right auricle and also a systolic murmur on the right side and a strong, venous pulse. Stenosis of the right venous opening and defects of the pulmonary valves are extremely rare.

The latter produces hypertrophy and dilatation of the right ventricle, diastolic bruits and difficulty in respiration. In stenosis of the opening there is hypertrophy of the right side, systolic murmurs, small weak pulse, cyanosis and disturbed respiration.

We very frequently have a combination of a contraction of an opening and also a deposit on, or retraction of, the valve at that opening, and also a single valvular defect; sometimes defects of two or more valves may occur at the same time, and these conditions make a combination of symptoms that are hard to separate.

Prognosis and Therapeutics of Valvular Defects of the Heart.—A diseased valve must be considered incurable, but it may exist for a long time without causing any decided disturbance of the general circulation. It is impossible to predict how long a "compensating" state will continue, even though age, nutritive condition and manner of use of the patient may furnish a certain support or favorable influence to the type of heart disease. Stenoses of the cardiac openings are generally less favorable to judge than insufficiencies of the corresponding valves; symptoms of incompensations are always very alarming.

Mitral defects seem to last the longest. This conclusion is arrived at from the fact that it is quite common to find serious heart defects in post-mortems on dogs that have been apparently healthy during life.

Compensating heart defects do not require any treatment. We try to aid the heart in its efforts by giving nutritive diet and removing all exciting causes, such as great or prolonged exertion.

It is also advisable to see to it that the bowels move regularly (if necessary using mild laxatives) because congestion of fæces increases the intraabdominal pressure, and this indirectly encroaches upon the activity of the heart. A mild diuretic may be beneficial at this stage.

As soon as the heart begins to weaken and the difficulty in respiration increases, accompanied by œdema, palpitation, etc., we must enforce absolute physical rest and use heart tonics, such as digitalis, strophanthus, caffeine, etc.

℞. Tinc. Strophanthus, 15.0
Sig.—Ten to twenty drops morning and evening.

℞. Caffeine nitricum, 0.5
M. F. charta No. x.
Sig.—One powder morning and evening.

℞. Caffeine citrate, 3.0
Tinct. digitalis, 4.0
Aquæ, 64.0
Sig.—One teaspoonful twice daily.

℞. Infus. fol. digitalis 1.0:150.0
Sig.—One tablespoonful to be given two to three times daily. (Beware of cumulative action!)

If by medicinal treatment we succeed in re-establishing a compensating action, the œdema gradually disappears; if, however, we do not get the desired result and there should be any œdema remaining, we must treat it symptomatically, using those diuretics mentioned under the treatment of pleurisy, particularly theobromin and theophyllin preparations. Calomel, especially in combination with digitalis, is also used often. Where there is decided palpitation, we must use cold compresses in the region of the heart, or subcutaneous injections of morphia. In milder cases use the salts of bromine. Great weakness of the pulse must be treated with stimulants such as alcohol, ether, or camphor, etc., and anæmia with iron preparations. Tinc. nux vomica may be given in doses of one drop three times daily, as well as Amara and hydrochloric acid when the appetite is poor.

Fibrolysin is recommended to reduce the thickened valves. Further information will be given under Ascites and Hydrothorax.

The symptoms above described are sometimes found in dogs that do not present any marked alterations in the valves or openings, either during life or on post-mortem; these are due either to simple idiopathic hypertrophy and dilatation or to alteration of the heart muscle.

Diseases of the Heart Muscle.

Idiopathic Hypertrophy and Dilatation of the Heart.—By hypertrophy of the heart we mean an increase in thickness of the heart muscles; by dilatation of the heart (dilatatio cordis) we mean an enlargement of the cavities of the heart. Both conditions usually occur in conjunction with one another and can be traced to resistances of the circulation and influences which continuously increase the blood pressure. Most cases to be considered are defective valves in which the resulting hypertrophy of the heart immediately causes a compensation. Less often do we find aneurysms, stenosis or thromboses of the aorta, chronic lung or kidney diseases or infectious diseases. Furthermore, continued physical exertion (draught dogs, also during training) may be taken into consideration as causes (idiopathic hypertrophy of the heart). Heart dilatation with a tendency towards a retrograde process sometimes appears very suddenly in connection with a single, very severe exertion. We find on post-mortem, as a rule, a hypertrophy of the left ventricle, but occasionally it is of both ventricles. At the same time we do not find any alteration of the lungs or kidneys which might produce secondary hypertrophy of the heart muscle. The causes are extreme and constant exertion, cold, abnormal excitability of the heart (in closely bred lap dogs), overfeeding, and too much rich blood (as in pet animals).

Clinical Symptoms and Therapy

Hypertrophy of the heart manifests itself by increased heart dullness, strong, palpitating, perhaps a somewhat diffused, heart beat, very strong, tense pulse and augmented heart tones; dilatation of the heart manifests itself by increased heart dullness, strong throbbing diffused, sometimes arhythmic heart beating, small soft later an irregular pulse and a stronger first and more indistinct second sound. In idiopathic hypertrophy of the heart disturbances of the general condition of the body may be absent entirely; if dilatation of the heart then also occurs, then the symptoms appear in a gradually increasing degree that, in general, denote a defective heart; irregularity and increase in the pulse rate, difficulty in respiration, rapid weakness during work, attacks of vertigo and dropsical symptoms.

Treatment of genuine hypertrophy of the heart is useless; cardiac tonics (digitalis) are especially contraindicated. In later stages when heart dilatation and cardiac weakness make their appearances along with the hypertrophy of the heart, then the treatment resembles that of incompensated defective heart.

Inflammation of the Heart Muscles, Myocarditis

A distinction made between acute and chronic myocarditis. The acute form appears in most cases during the course of an acute infectious disease as well as in some cases of poisoning, while the chronic form, also known as the indurated or calloused myocarditis, results from the acute or at the very start begins in a slow manner so that it is impossible to determine any particular cause of the disease.

This condition may follow an attack of acute distemper and is often mistaken for valvular defects. In this condition the heart is greatly enlarged and dilated, and the walls are hypertrophied. The body of the heart muscle is filled with a number of whitish hard bodies which on examination are found to be cicatricial connective tissue, or the entire wall of the heart may become fibrous in one place after atrophy of the muscle elements.

The cause of the existence of these bodies has not been fully determined, but they are due either to myocarditis or to defective nutrition of the heart muscle, as a consequence of contraction or atrophy of the coronary artery.

A blister-like bulging of the heart wall (aneurysma cordis) sometimes develops as a result and under certain conditions these thin, weakened places may burst (heart rupture) with fatal result. In general, certain sections of the heart are often found to be more or less hypertrophic or dilated.

The clinical symptoms presented are as follows: Weak heart, palpitation, dizziness, vertigo, increase in the number of pulse, but the pulse, small, often thread-like and irregular, the palpitations that at first appear tumultuous, later become weaker, respiration is rapid and difficult, cyanosis, trembling, stubbling, feebleness, and when the course becomes protracted dropsical effusions.

Auscultation gives nothing but pure heart sounds, and with the above symptoms there may be a callous degeneration of the heart or a pure idiopathic hypertrophy, as during life it is impossible to determine which, and treatment in both cases is the same. Treatment is of no practical value; it consists of protection against excitement or great bodily exertion; give nutritive, easily digested food, and, if the heart is irregular, heart tonics.

(Digitalis, strophanthus, caffeine, alcohol, camphor suitable treatment of the original disease, especially combating the high fever in infectious diseases.)

Other Diseases of the Heart

Nervous Palpitation, Palpitation of the Heart.—In this condition the physical examination reveals no anatomical alteration of the heart. The heart beats with great force, so that it can be noticed distinctly on the external thoracic walls, often with such force that the walls vibrate and the beats may be heard at some distance; the beat is clear, sometimes rhythmic, and in cases where the palpitation is great, the heart makes only one sound; the respirations are accelerated and shallow. The pulse is small, rapid, often irregular, the animal is anxious and restless, but, as a rule, if kept quiet, the attack soon passes off. If continued apply cold compresses in the region of the heart and give a hypodermic solution of morphine or administer sodium bromide, chloral hydrate, etc. Sometimes nervous palpitation is observed in thorough-bred, very lively, nervous dogs following physical exertion or psychic excitement.

Tumor of the Heart.—These mentioned by a number of authors are either of sarcomatous or fibrous nature, are usually never diagnosed during life, but may be seen on the post-mortem of an animal dying suddenly—e. g., Jungers observed a case of a mastiff with a pear-shaped tumor, weighing 19 grams, located in the left auricle in the auriculo-ventricular opening and firmly closed the opening. Sometimes symptoms appear which lead us to assume with more or less certainty that a heart disease is present, but no definite conclusions of the nature of the disease can be reached.

Parasites in the Heart Muscles.—Cysticercus or bladder worms are found in the heart. These occur very rarely. Lindmere found in the external strata of the tissue in the heart of a dog a number (20-25) of cysts about the size of a hazelnut which were filled with a clear fluid, which seemed to be the cysticercus cellulosæ. There was nothing to indicate that these parasites caused the heart the slightest irritation, for neither hypertrophy nor dilatation were discovered nor any inflammatory condition near the cysts.

DISEASES OF THE PERICARDIUM

Pericarditis

(Inflammation of the Heart Envelope)

Etiology.—Inflammation of the pericardium is, in general, a rare occurrence and usually a secondary disease. It may originate in a primary way by traumatisms or cold, or, secondarily, in connection with infectious or inflammatory diseases of the neighboring organs, especially pleuritis, or disease of the endocardium and myocardium. It is a question whether this condition can originate from perforation of lung abscesses or from foreign bodies coming from the œsophagus. Tuberculosis seems to be the most frequent exciting cause of this disorder. Traumatisms such as gunshot wounds, fracture of ribs, may cause pericarditis. Cold or rheumatism is said to be a predisposing cause of pericarditis, but this theory is very doubtful.

Cadiot is of the opinion that over three-fourths of all cases of pericarditis are caused by tuberculosis.

Pathological Anatomy.—Pericarditis occurs either in the acute or chronic form. The anatomical alterations that it produces on both surfaces of the pericardium correspond to those on the pleura caused by pleuritis, and are usually differentiated according to the nature of the exudate, and occur in the following forms: Fibrinous, sero-fibrinous, hemorrhagic, purulent or icteric. The most common form is sero-fibrinous pericarditis, with copious liquid exudates in the pericardium and masses of fibrinous lymph attached to the surface of the pericardium; the two folds of the pericardium are forced apart more or less by large quantities of liquid exudate in very rare instances, and especially in the later stages and in more chronic cases, the folds are attached to each other by adhesions formed by connective tissue. When this condition has been present some time, the pericardium becomes dilated and relaxed and the heart-muscle shows more or less atrophy; the pericardial folds then generally become greatly thickened and the pericardial sac may be completely obliterated.

Clinical Symptoms.—Slight pericarditis rarely shows itself to any marked degree because of the few characteristic symptoms, but in severe cases there is decided palpitation, the pulse becoming weak and indistinct, with marked irregularity in the rhythm. On auscultation there is great dullness all over the region of the heart, with a noticeable increase upward and in breadth, and often there is a significant change in location of the dull area upon a change of position of the patient. Finally the heart sound is entirely lost or simply a pericardial rubbing bruit is heard. This bruit is caused by the rough pericardial folds rubbing against one another.

When the pericardial folds are attached by pericarditis adhesions, or when they are separated by effusions this sound disappears.

Besides these rubbing bruits which are heard near the heart, there are the heart sounds, but these grow less and less according to the increase of exudate causing the disappearance of the heart beat and are finally heard very indistinctly. The behavior of the heart sounds also depends on the condition of the cardiac valves. Furthermore, a very definite venous pulse is often evident.

There may be an increase of temperature, loss of appetite, and the slightest exertions cause marked increase in the respiration with cyanosis of the visible mucous membranes. As soon as the disease becomes advanced, the same symptoms that are seen in any case of incompensated defective heart action are noticed; the lessened arterial pressure causes irregularity in the action of the urinary apparatus, and from venous stagnation dropsy shows itself in different parts of the body, especially in the extremities.

With reference to the course, milder forms of pericarditis may, after a relatively short time, recur again. In severe forms, especially with purulent or icteric exudates, as well as pericarditis, which occur as a result of acute infectious diseases, pleuritis and pleuro-pneumonia, we may have acute inflammation of the pericardium and death as a result within a few days. Chronic pericarditis usually in the course of time may also produce death; its action, however, is slower.

Therapeutics.—Keep the animal as quiet as possible; give nutritive, easily digested food (meat diet or milk) and such agents as will lessen the fever and tone up the heart. The Priessnitz compress and cold-water compresses on the heart region might produce better effects, but they excite the animal and thus do more harm than good. The embrocation used in pleuritis is helpful and mild. Laxatives, such as sulphate of magnesium or sodium, Epsom salts, calomel. As heart tonics give strophanthus or digitalis, etc.

To assist the resorption of exudates diuretics can be prescribed in the same manner as for pleuritis.

When the exudate accumulates to an alarming extent, we must resort to surgical means and empty the pericardium by means of the trocar, as in pleuritic effusions, and must be careful to use as long and as thin a trocar as possible. (An aspirating syringe needle is the best.) Select a space over the dullest part of the heart and insert the trocar low down in the left chest wall, taking care not to put the point in too deep and thus injure the heart itself.

The treatment of pericarditis is generally symptomatic. If great weakness of the pulse is observed administer wine, alcohol, ether, or camphor; the latter seems to be best to use for this particular affection.

Dropsy of the pericardium (hydropericardium) is a collection of serous fluid in the pericardium without any direct inflammation of the pericardium being the cause.

In health the pericardium always contains a small amount of fluid, and it is only when we recognize, by physical means, a very much increased amount of fluid in the sac that it can be called hydropericarditis. Dropsy of the pericardium may appear as a symptom of various diseases (defects of the valves, inflammation of the heart muscle, diseased conditions of the coronary arteries or of the kidneys, and acute anæmia) as well as in connection with inflammation of the pericardium and is generally accompanied with all the symptoms of general dropsy.

Occasionally pericarditis also accompanies hydropericardium. This latter can be distinguished from pericarditis by the lack of fever and rubbing bruits in the former as well as by the presence of other dropsical symptoms.

The clinical symptoms are those of pericarditis; the friction bruit and the increase of temperature are absent; however, the treatment consists in removing the original causes, and, if this cannot be done, to puncture. Diuretics (digitalis) and cardiotonics are to be administered, but these, as a rule, only produce temporary effect.

Hemorrhage of the Pericardium (Hæmopericardium).—This is rarely seen. It may be caused by contusions or direct injuries, especially gunshot wounds, less often by a bursting aneurysm of the aorta (see also spiroptera sanguinolenta), or by laceration of one of the coronary arteries, rupture of heart resulting from the formation of tumors, etc., of the myocardium. Death by compression of the heart generally occurs either at once or hours later with the symptoms of an internal hemorrhage.

Where results are not fatal in a short time—that is, where the blood oozes out slowly and fills the sac gradually—it is impossible to make a certain diagnosis unless the diagnosis is based on the appearance of acute anæmia, and on the presence of a liquid exudate in the pericardium. This is also the case when air or gas penetrates into the cavity from the lungs in cases of some traumatism of those organs.

Pneumopericardium.—A collection of gas in the pericardial sac. Regarding the symptoms of a collection of air or gas in the pericardial sac as a result of trauma (air) or as a result of ichorous pericarditis (gases of putrefaction). The reader is referred to page —. A possibility of a cure in case of traumatic pneumopericardium might exist if no infection of the pericardium takes place at the time of injury.

DISEASES OF THE BLOOD VESSEL; WORMS IN THE BLOOD

Thromboses of the Femoral or Axillary Arteries.—Thromboses of these arteries occur essentially in service dogs, even though they are seldom met. When at rest or after short slow exercises the affected animal does not show any indications of being diseased. However, when subjected to more strenuous exercises (running, pulling, jumping) the affected limb develops a progressive lameness. The limb feels noticeably cool; the pulse is weak or is not discernible at all. Simultaneously there is increased respiration and pulse and cyanosis of the visible mucous membranes. Shortly after rest the former normal condition will prevail and when repeating the exercises the lameness will reappear. Frequently in such dogs a difference can be detected in the pulse on one side from that of the other side. Treatment of any kind is not promising. Rest, rube facients—e. g., massaging the limb with stimulating fluids; potassium iodide and fibrolysin may be tried.

The other anomalies of the blood vessels can perforce not be examined during life. Nocard found in a young dog an aneurism of the aorta and pulmonary artery. Barrier observed in a dog that was suffering from an aneurism noticeable loss in flesh, progressive weakness, pronounced dyspnea following the last exercise, and finally lameness. The cause of aneurism may be traumatic influences, parasites (spiroptera) and arterio-sclerosis. In humans, potassium iodide is used among other things.

FILARIA IN THE BLOOD

Four kinds of parasites have been found in the blood of the dog—namely, Filaria immitis, Hæmatozoon lewisi, Strongylus vasorum, and Spiroptera sanguinolenta.

Filaria Immitis, Filaria Hæmatica and Other Species of Filaria. (Males 15 cm. and females 35 cm. long; both 1-1.5 mm. thick.) These parasites are the cause of filariasis or thread-worm disease which occurs in China, Japan, Eastern Asia, less often in America and rarely and practically only in imported dogs in Germany. They lie inside of the heart cavities; very rarely in the left, generally on the right, where they multiply in great numbers, often hundreds massed in a ball (Megnin); they are rarely found in any other part of the vascular system—e. g., in the pulmory artery and its branches, or (some On the other hand, the embryos (microfilaria) measure 0.25 mm. long and 5 mm. thick, are found in the circulating blood in hundreds of thousands and can be readily seen under the microscope in a sample of blood of the affected animal (Delafond, Nocard, Gruby, Renther, Johne, Rieck, Deffe, and others). The mature filariæ living in the heart (Fig. 91), cause disturbances of the circulatory system, dilatation and hypertrophy of the heart, endocarditis, formation of thrombi with all its results, and even rupture of the heart. The embryo circulating in the blood may plug up the small arteries, particularly of the lungs, brain, kidneys and spleen. The embryos seem to be excreted through the kidneys. The disease is transmitted by gnats, especially Culex and anopheles species. This parasite is generally found in Indian, Chinese, and American dogs, especially in the southern states. Wheeler rarely made a postmortem that he did not find it, often without presenting any observable symptoms during life. It is rarely found in Europe. The clinical symptoms are not at all characteristic—emaciation, anæmia, increased bodily weakness, peculiar lameness, weakness or lameness of the affected limb, dizziness, difficult respiration, hæmaturia, jerking of the muscles, epileptiform convulsions, disturbance of the heart action, intestinal hemorrhage, and excitement—but frequently the filaria may exist in great numbers and none of these symptoms

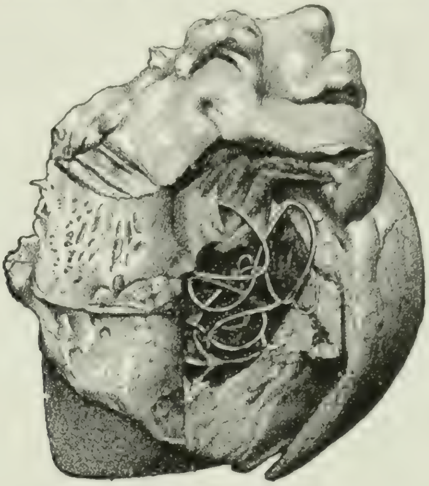


FIG. 91.—Heart, with Filaria immitis in the ventricle (*photograph*).

be present unconsciousness, dyspnœa, and rabiform symptoms. On the other hand, death sometimes occurs very suddenly, resembling apoplexy. The diagnosis must be made by establishing the presence of microfilaria in the blood.

How the parasites find their way into the blood is rather interesting. The embryo is passed in the urine and carried by air or water into rice fields or swampy places, and the parasite finds its way into the system through the dog drinking the water. Some authors contend that the larvæ get into the blood as the larvæ of the Filaria sanguinis of man by being first absorbed by the mosquito and then developed and passed again to the dog.

Frohner tried to reinoculate a dog intravenously with blood containing the embryo, but with negative results.

As to prophylactic or therapeutic measures, nothing has as yet been found to answer the purpose. In regions where the parasites exist, the administration of boiled or filtered water could be carried out only in the case of household pets; diuretics tend to wash the parasites from the kidneys. Frohner says that in Japan, where the parasite is prevalent, arsenic is used with advantage. Attempts should be made to keep away the insects that act as carriers of the disease.

Hæmatozoon Lewisi. These parasites are very small, resembling Filaria immitis found comparatively often in the blood of dogs in India, China, Italy, and France. Grassi thinks the larvæ develop in the fleas and lice that infest the dog.

Strongylus Vasorum (Hæmatozoon Subulatum).—These parasites are known to exist only in certain parts of France and seldom in certain parts of Italy. Leisering found them in two dogs in the blood, lungs, prostate, and the spongy portion of the penis. He considers Hæmatozoon subulatum—and it is still an undecided matter whether they are—identical with Strongylus vasorum or a different form, or whether they gained entrance into the animal after death. These parasites produce anæmia, gradual emaciation, irregularity of the heart's action, and cough.

Spiroptera Sanguinolenta (Filaria Sanguinolenta).—This parasite has already been described. Especially in its larval form it is often found in the blood or aneurysms, which sometimes burst and form hemorrhages into the pericardium, then causing death, or entering the pulmonary circulation incomplete are carried into the lungs.

DISEASES OF THE URINARY APPARATUS

EXAMINATION OF THE URINARY APPARATUS

This comprises the examination of the urethra, bladder, kidneys, and especially of the urine.

Examination of the Urethra

The examination of the urethra can be made from without or within (and is indicated where there are difficulties in voiding the urine or where there is entire retention of urine by introducing a catheter or a sound.

The examination from the outside is restricted, under ordinary conditions, to those parts of the urethra which can be reached when the prepuce is pushed back from the penis and by finger palpation through the rectum, whereas no special result can be expected from an examination of the part along the perineum. In the bitch a part of the urethra can be palpated with the fingers from the vagina. Sensitiveness to pressure during palpation of the urethra denotes inflammation, and in the event that palpation discloses a hard, round, circumscribed painful place somewhere along the course of the urethra it indicates a urinary calculus. The calculi have a tendency to lodge just in front of the place where the urethra enters the groove of the os penis.

If after pressure or rubbing of the penis a glossy or purulent discharge comes from the prepuce, it indicates a catarrhal condition of the part (catarrh of the foreskin or gonorrhœa of the prepuce). If the discharge is purulent, bloody, and has a fœtid odor, we will almost always find wounds, ulceration, swellings, or new formations in the urethra, on the prepuce or the glans. To make an examination of the penis, we must lay the animal on its side, take hold of the base with one hand and with the other retract the foreskin, so as to expose the penis as far back as the glans, and in this way it is comparatively easy to make an examination. If it is found impossible to expose the free portion of the penis, it indicates phimosis or an abnormally narrow opening of the prepuce, while paraphimosis is a condition in which the greatly distended glans is outside of the opening of the retracted prepuce. Catarrhal affections (urethral or gonorrhœal) of the urethra are very rare in the dog. They are recognized by a discharge of purulent mucus from the urethra, by difficulty in urination, and the animal, on catheterization, may pass purulent mucus from the urethra. In cases where there is great difficulty in passing urine, or where it is retained entirely, it becomes necessary to pass the catheter or sound. When this retention of urine occurs, it is generally due to the presence of a stone in the bladder, a collection of stones in the urethra, or swelling of the prostate, but it may also indicate cicatricial strictures of the urethra, irritants, acute cystitis, distention of the bladder by prolonged retention of urine, stone of the bladder, or neo-formations in the bladder.

Passing the catheter in the dog: This can be done with little difficulty in the male dog. It is best to use an ordinary rubber catheter in the male dog (about 2 to 5 mm. in diameter and the ordinary length of 30-60 cm.) Fig. 92. The subject is laid on the left side or back and held in that position by an assistant. The prepuce is pushed back behind the swelling of the glans and held firmly with the left hand (see Fig. 93). Now grasp the catheter with the right, of course first seeing that it has been well lubricated with some oil or cosmoline and that it contains the wire-stylet, and introduce it carefully into the urethra; if it is pushed forward up the canal and meets with an obstruction at the posterior end of the bone of the penis, it is due to a flexure of the canal and also to the fact that the diameter of the urethra is less and the part at that portion has slight contractile properties. By a gradual pressure the stricture is overcome and the catheter passed upward to the arch of the perineum; here the wire-stylet must be withdrawn from the catheter at least one-third, so as to allow the catheter to round the curve of the ischial arch; a gradual pressure soon brings it into the bladder, when the wire can be removed entirely.

In the bitch catheterization is very difficult at times, for, while the instrument should be introduced along the middle line of the vestibule, frequently it is almost impossible, especially in small bitches, to find the narrow opening of the urethra, on both sides of which a small blind sac (cul-de-sac) is located, and a vaginal speculum is sometimes necessary to locate the position of the opening; we generally use a metallic catheter, either silver or German silver (Fig. 94). The instrument is passed up on the floor of the vagina until it comes in contact with the urethral opening (see Fig. 95); this is closed with a slight sphincter (the so-called urethral valve); this is soon overcome and the catheter

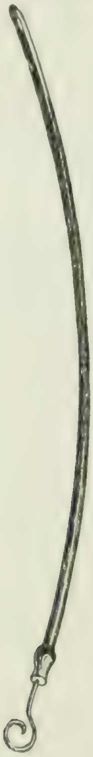


FIG. 92.—Male catheter.

passed into the bladder without difficulty, except in cases where the urethral opening is extremely small.

This can be done more easily if the catheter is pushed along the forefinger, which was previously inserted into the vagina, but it cannot be accomplished in small bitches. The author found it beneficial to use a vaginal mirror or vaginal speculum (see later) to view the urethral opening and which can be pushed through the vulva into the vaginal vestibul if the mirror used is the size of an ear speculum (see later) and is manipulated in like manner. However catheterizing such bitches is so difficult that it is only done in case of extreme necessity. In bitches the use of the elastic catheter is often replaced by a metallic, straight catheter or one slightly bent at the tip. This type of catheter

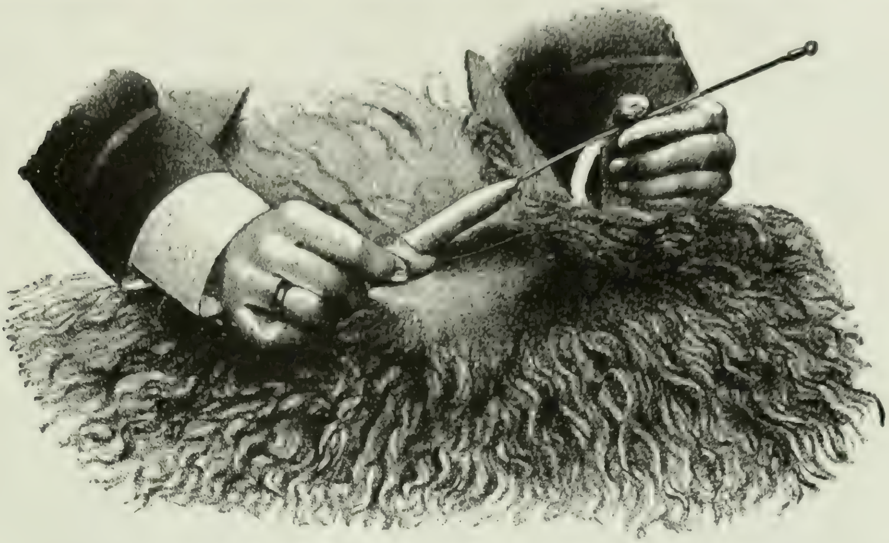


Fig. 93.—Passing the catheter.

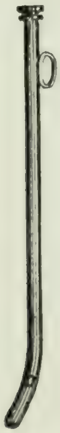


Fig. 94.—Female catheter.

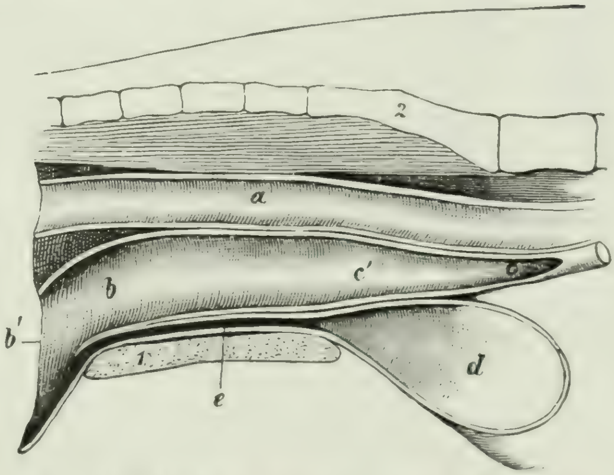


Fig. 95.—Median section through the pelvic cavity; *a*, rectum; *b*, vagina; *b′*, vulva; *d*, bladder; *e*, urethra; *l*, public symphysis.

can be inserted more easily and sterilized with less trouble. Furthermore, the catheter needs to be inserted into bitches but rarely.

In the bitch it is rare that an examination of the urethra is necessary, but certain discharges from the vulva are of diagnostic value. During the period of "heat" (menstruation), which occurs normally twice a year, in June or July and in December or January (this, however, is not a hard and fast rule, as it may occur in April or May and November or October), we have a copious bloody discharge, and during the preparatory stages of labor we see a thick, clammy discharge, and the lochia commences with a non-fœtid, serous, slimy discharge, which soon changes to a thick, yellowish fluid. Purulent, putrid, and bad-smelling discharges are generally found in inflammatory or ulcerative discharges from the vagina or uterus. It may also be observed when a carcinoma is present. In such cases it is best to introduce a mirror-speculum into the vagina and make a specular examination. The instrument to use is the so-called two-valved rectal mirror (Fig. 96). Digital examination of the vagina is often productive of more certain diagnosis.

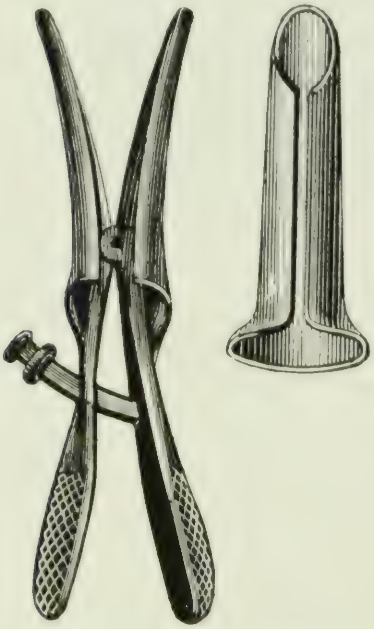


FIG. 96.—Mirror speculums.

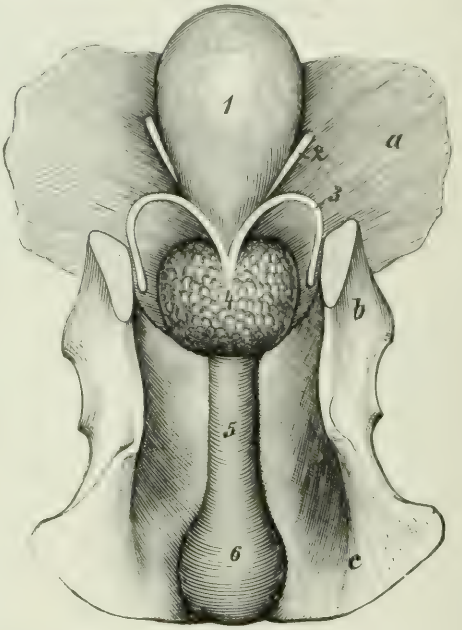


FIG. 97.—Section through the pelvis of the male: 1, bladder; 2, opening of the ureters into the bladder; 3, spermatic ducts; 4, prostate gland; 5, urethra, showing Wilson's muscle; 6, arch of the urethra; c, pelvis.

Examination of the Prostate

This body varies in size, but in the dog it is large in comparison to the relative size in other animals, varying from the size of a hazelnut to that of a walnut. It is a round, ball-like body cut into two portions, lying on the neck of the bladder where the urethra commences (Fig. 97). It lies about the anterior portion of the pubic bone, and being free to a certain extent, it can be pushed into the abdominal cavity with the finger. In hypertrophy of the prostate, we find a painless hard body varying from the size of a walnut to that of a small orange. Acute prostitis is extremely painful and we find increased local temperature, prostatic abscess indicated by fever and fluctuation of the prostate. The prostate may be covered by a number of irregular knob-like bodies, invariably painless to the touch. A remarkable diminution of an enlarged prostate invariably follows castration in the male.

Examination of the Bladder

The bladder is almost entirely covered by peritoneum and lies just anterior to the brim of the pelvis, or in some cases it lies entirely in the abdominal cavity. When the bladder is very much distended, it extends as far as the umbilicus and fills up the lower portion of the abdomen. It can be distinguished by manipulation. It is a round, distended, tumor-like body, giving a dull sound on percussion. On examination of the rectum we not only feel the neck of the bladder and the prostate, but the bladder itself can be easily distinguished. The empty bladder cannot be felt by palpation of the abdominal wall; if partly filled it can sometimes be distinguished in dogs with a flabby abdominal wall, and then resembles a pear-shaped body varying in size from that of a hazel nut to that of a pigeon egg, and is located just anteriorly to the margin of the pelvis. If the bladder is excessively filled it lies too close to the abdominal integuments at the sides as well as downward, and then often causes, especially in thin dogs, a more or less noticeable bulging of the abdominal wall. Upon percussion of these places a strong dull sound is heard, which, in contrast with the dullness of fluid accumulations in the free abdominal cavity, remains unchanged when the position of the animal is altered.

Percussion in the region of the bladder when it contains a very little urine or is empty gives a hollow sound. Tumor or stones in the bladder can be felt by pressing down toward the wall of the abdomen, provided the bladder is empty or only partially filled; under similar conditions it is sometimes possible to feel gravel in the form of small, sand-like granular masses upon manipulation of the bladder; pain on pressure in the region of the bladder indicates an inflammatory condition of the bladder (catarrh of the bladder), and in this condition the animal evinces more or less pain even when the bladder is normally distended and any pressure put on it.

If the bladder is excessively filled, then the animal will evince pain, even if the bladder is normally healthy. An increased consistency or a certain hardness of a moderately filled bladder may occur in case of tumors of the bladder or in chronic catarrh of the bladder. Further information is given later on under "examination of the urine."

Examination of the Kidneys

The kidneys are bean-shaped, comparatively thick, and are almost entirely covered by peritoneum; they lie in the lumbar region, the left kidney about the thirteenth rib, the right kidney sometimes larger than the left, about the twelfth rib; posteriorly the kidneys extend over the second, third, and sometimes to the fourth lumbar vertebræ, the left generally extending to the third or fourth vertebræ and the right to the second or third; in rare instances the left kidney may be still further back, both kidneys lying directly opposite each other. Frequently they are readily distinguished by manipulation through the abdominal walls, and especially one or the other kidney may lie free from its attachments or be abnormally enlarged during life. This condition may be found to exist without any symptoms of it having been evinced by the dog. The left kidney is always much easier to palpate than the right. The best position is to have the animal standing, holding the thumbs on the vertebra and with the other fingers to the right and left manipulating the abdominal walls until the outlines of the kidneys are recognized. A satisfactory examination can no doubt be made best only when the abdomen has a certain looseness and the animal is not fat.

Pain on pressure may indicate nephritis, pyelonephritis, or paranephritis; enlargement of the kidney would indicate tumors (the kidney is generally uneven, rough or nodular), abscesses, pyelonephritis, hydronephrosis or purulent paranephritis, also tuberculosis of the kidneys (enlargement of the kidneys may be determined to a certain degree by percussion dullness); abnormally small, hard kidneys may indicate a chronic interstitial nephritis. Change of the position or remarkable mobility would indicate floating or migrating kidney; fluctuation would denote abscesses, hydronephrosis, etc.

Examination of the Urine

The urine has to be examined as to its amount, manner and frequency of discharge, color, transparency, reaction, weight, odor, and the presence of certain foreign or chemical substances.

Amount of Urine.—The amount of urine passed in one day depends largely, of course, on the size and age of the animal, the quantity of fluids it drinks, and the temperature and humidity of the atmosphere. It is difficult to estimate the exact amount of urine an animal will pass under normal circumstances, as one animal may remain indoors, is house-broken and retains his urine until he is allowed to go outside, and other animals that are free urinate small quantities at every street corner. Friedberger and Frohner found dogs confined in cages urinated two or three times in twenty-four hours, but the amount even in individuals varies, exercise having great influence on the amount excreted. The average amount of urine passed by the larger kinds of dog with normal amount of liquid food is from 0.5 to 1.5 kilogrammes daily; in smaller breeds, one-half that amount (large dogs 500 to 1,500 ccm.; medium size dogs 200-500 ccm.; and small dogs 40-200 ccm.).

An increase in the frequency of the act of urination occurs primarily in diseases of the bladder—e. g., catarrh of the bladder and also when there is a pathological increase in the quantity of urine (polyuria). This is also the case in congestion of the kidneys (arterial hyperæmia of the kidneys), as it is apt to appear after the consumption of certain diuretic drugs and poisons; also in most forms of chronic nephritis, in diabetes insipidus and d. mellitus, and in certain diseases of the central nervous system after rapid absorption of large exudates and transudates, in the convalescent stage of many acute diseases, etc. It is also to be noted that in case of carnivora as well as in dogs the amount of urine increases after giving a pure vegetable diet and as a result the animal must of course urinate more frequently than usual.

A decrease in the amount of urine passed (sometimes resulting in complete cessation of production of urine, anuria) indicates that the water of the body is being taken up through some other channel, as in violent diarrhœa, great salivation, during the formation of pleuritic or peritoneal exudates, or in dropsy, in fevers, in decrease of the pressure of the heart, as in non-compensation of valvular defects, myocarditis, in some cases of poisoning, etc. An entire stoppage of the urine may occur in acute or subacute inflammation of the kidneys, in obstruction of the urethra, paralysis or rupture of the bladder, from calculi in the bladder or urethra, from stricture of the urethra, or from swelling and pressure of the prostate, or from certain poisons.

An increase of the amount of urine (polyuria) may be due to the presence of a large amount of water in the blood (anæmia, hydræmia), in atrophy of the kidney, where there is great reabsorption of exudates and transudates, or in diabetes mellitus (a condition that corresponds to diabetes insipidus in man). This, however, is extremely rare in dogs. We may see it after the administration of the different diuretics. It is frequently seen in convalescence from acute diseases.

Constant dribbling of urine without special utterances of pain by the patient (incontinentia urinæ) indicates paralysis or weakness of the bladder, or of the sphincter vesicæ as it appears in affections of the spinal cord and in old age, but also occurs occasionally in severe cystitis, bladder tumors, etc.; and also temporarily in young dogs, particularly during psychic excitement (fear, fright, joy). It sometimes happens that young, vigorously fed dogs discharge semen involuntarily (pollutions) during the night, thus wetting the bedding, and leading one to suspect incontinentia urinæ. Difficulty and more or less pain in voiding urine (dysuria, stranguria) sometimes complete retention of the urine (ischuria retentio urinæ) occurs, especially when urethral calculi are present; nevertheless inflammatory and ulcerous processes or cicatricial structures of the urethra, also severe cystitis, over distention of the bladder by prolonged retention of the urine, detrusor paralysis, urinary calculi in the bladder, growths in the bladder, enlargement of the prostates (see later), etc., may be the cause. Similar symptoms may also appear in certain cases of poisoning (strong spices, cantharides), in peritonitis and as a result of pressure of excessively filled portions of the intestines on the bladder. Cessation of the urge to urinate in ischuria with the bladder filled causes one to suspect that the bladder has ruptured.

The Color of the Urine.—This varies in the healthy dog from pale yellow, when it has few chemical constituents, to dark reddish-yellow, when it is concentrated and has a high specific gravity. Food also has a certain influence on the color. After eating fat it is reddish-yellow, and after meat it is light yellow; after eating sugar or bread it is dark yellow, and when the animal is starved it is deep yellow. Disease has also a great effect on the color. Under abnormal conditions it appears very dark. It is a deep yellow to brownish red in fevers, in diarrhœa, after prolonged retention of the urine in the bladder, and in all conditions that include the consumption of small amounts of food and drink, and pale and colorless in diabetes mellitus or insipidus, of polyuria, during convalescence from many internal diseases, and in chronic interstitial nephritis. After the administration of diuretics it is light in color, and in disease of the liver the coloring matter of the bile may change the color of the urine to all shades of yellow, varying from lemon-yellow to deep or even brown-yellow (see icterus).

Icteric urine will produce a yellow foam if shaken and will color blotting paper yellow. A red color is produced by the coloring of the blood. (This occurs in: 1—Hæmaturia, when blood is mixed in toto with the urine, the intensity of the color then depending upon the num- of red blood corpuscles present. 2—In hæmoglobinuria, when only the coloring matter of the blood is found in solution in the urine. Concerning the occurrence of hæmaturia, further information will be given on pages following.) A green or light brown, by diseases of the liver and catarrh of the duodenum. Constant dribbling or slow voiding of the urine without any apparent pain (incontinentia urinæ) indicates weakness or paralysis of the sphincter or the bladder itself; it may occur from certain affections of the spine, in acute cystitus, or from tumors of the bladder. Difficult or painful urination (dysuria, retentio urinæ) or even total retention of urine indicates urethral calculus or certain poisons. Hæmoglobinuria is found in piroplasmosis and following the administration of certain of the febrifuges such as chlorate of potassium, pyrogallol, chrysarobin, naphthol, analine, kairin, thallin, acids, etc. Also from intense burns, occasionally in septicæmia and in infectious hæmorrhagic gastro-enteritis, in acute cases of distemper, and from sudden chills. Antipyrin, analgia, sometimes sulfonal and trional turn the urine yellowish red to blood red; antifebrin a reddish yellow, blackish brown to black, and aloe red to brownish red. Rhubarb and senna turn the urine yellow, while the addition of an alkali turns it purplish red. Chrysarobin and cascara sagrada turns the urine intense yellow, santonin and cina produces a red-yellow. Analine also produces a blood red. Naphthalin a brownish-red to dark brown; carbolic acid, or creosote, salol, resorcin and the various coal-tar products produce a greenish-black urine, which on exposure to atmosphere becomes dark olive-green. Thallin produces a yellow to dark brown urine with greenish tinge urine and a blue-red is produced by pyoctanin. The appearance of blood in the urine indicates grave conditions. In hæmaturia we may see the urine like blood, the color corresponding to the number of blood corpuscles present, and in hæmoglobinuria the coloring matter is granular or dissolved blood-coloring matter, actual blood corpuscles rarely being present, the urine then being dirty reddish-brown in color. Both the above conditions may exist simultaneously in some cases.

The urine may appear milky, milk-white (lipuria, chyluria) as a result of a mixture of fat in nephritis; notice should be taken of the fact that in very fat dogs, a small amount of fat in the form of fat globules occurrs normally on the surface of freshly voided urine which gives it a peculiar glossiness. This may also take place after too fatty a diet. Fat globules may also float about on the surface of urine that has been taken with a well oiled catheter.

Transparency and Reaction of the Urine.—When the urine has been passed recently it is clear and transparent, and has an acid reaction. After feeding with bread for some time or in case of a pure vegetable diet it is turbid and alkaline. H. Mueller has determined that the reaction of urine may be subjected to daily variations since some dogs void acid urine during the morning and alkaline during the afternoon. After feeding with fat it is alkaline. In pathological conditions when the urine has been passed recently it is turbid in nephritis (due to formed organic admixtures) and in all diseases of the urethra, especially in severe catarrh of the bladder, because it is filled with mucus and epithelium, pus cells, bacteria or triple phosphates.

In the latter case the normally thin, liquid urine has a more or less mucous-like or syrupy consistency. Dogs suffering from distemper often void urine more or less turbid. Furthermore, the urine of completely healthy dogs, especially when it is concentrated, sometimes shows a slight turbidity, so that it should not be looked upon at once as pathological. Admixtures from neighboring sexual organs (prostate, vagina) may also cause a turbidity. An alkaline reaction generally indicates catarrh of the bladder with ammoniacal fermentation of the urea taking place in the bladder; or we may see this condition in hæmaturia, in reabsorption of exudates, transudates, or in hemorrhage into the abdomen or thorax.

Odor of the Urine.—There is a slight penetrating odor in normal urine; sometimes it is described as meat brothy or slightly garlicky. The latter odor is evident especially after heating with limewater.

Sulphonal produces a fruity odor. In cases of catarrh of the bladder the urine has a strong ammoniacal odor, and when any amount of turpentine has been absorbed the urine has a faint odor of violets. If much ammonia is present when a glass rod is dipped in muriatic acid and held over the urine, a white cloud-like vapor arises from the urine.

The urine sometimes has a fruit-like odor after administering sulfonal and sometimes during diabetes mellitus; it has a gelatin-like odor during gelatine feeding. Similarly, camphor, carbolic acid, and other drugs may impart particular odors to the urine. A putrid odor of the urine has been observed in cancer of the bladder.

Specific Gravity of the Urine.—This varies in the dog between 1016 and 1060 with a median of 1030. It generally varies between 1020 and 1040, a specific gravity of over 1050 rarely occurs in healthy dogs.

It can be tested by means of the urinometer at a room

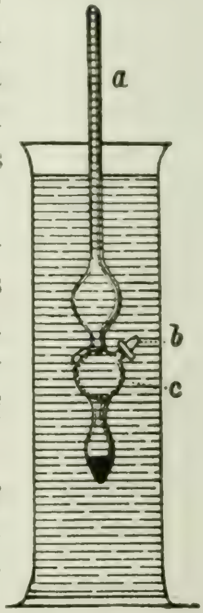


Fig. 98.—Areopikometer.

temperature of 15° C. or if we have only a small quantity we can test it readily by the areapikometer. This instrument the writer has found to be very useful. It is shown in Fig. 98. Place the urine to be tested into the receptacle C. Fill it full, taking care that there are no air bubbles in it. Close it by means of the glass stopper "b" and then sink it in water at 15° R. The specific weight of the urine will then be marked on the scale "A."

As a rule it will be found that healthy as well as pathological dark urine voided in small quantities has a high, and light-colored copiously voided urine, a low specific gravity. Thus, for example, the specific gravity of the urine in polyuria is conspicuously low, while the urine during fever shows an abnormally high specific gravity. But there are exceptions to this, for in diabetes mellitus the urine is clear, very pale in color, copious in quantity, and high in specific gravity, while in nephritis it is dark in color and has a low specific gravity. Dark urine seen during starvation has a low specific gravity in comparison with the urine discharged in larger amount during a meat diet.

Foreign Substances in the Urine.—The following substances appear in the urine under pathological circumstances. Mucus, blood, particularly red blood corpuscles, white and pus corpuscles, fat, epithelium, and tissues, urinary cylinders, animal and vegetable parasites, crystals, albumen, sugar, or coloring matter of bile and indican. Mention has already been made concerning the appearance of fat in the urine.

a. Mucus. Often found in very small quantities in absolutely healthy urine; mucus is found in the bladder under all conditions, either in health or disease of the urinary passages, and is found in particularly large quantities (mucous clouds, mucous shreds) in catarrh of the bladder.

b. Blood.—If the blood is mixed in the urine evenly and the corpuscles are reduced in size and cylinders are present, it indicates hemorrhage from the kidneys. If blood is present it is called hæmaturia and when the urine is stained with blood or blood-coloring matter it is called hæmoglobinuria or methæmoglobinuria. Heller's test, guaiacol test, benzidin test, or the spectroscope can be used to test urine for blood or blood coloring matter.

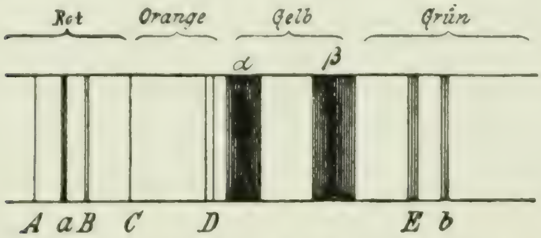
Heller's Test.—Add to the sample of urine a solution of caustic sodium or potassium, rendering it strongly alkaline; the solution is then brought to a boiling point, and a flocculent reddish-brown deposit is thrown down.

The reaction depends upon the formation of hæmatin due to the action of the sodium hydroxide. This is taken up by the earthy phosphates that split away at the same time and colors this reddish brown. This test is not very delicate, and administration of senna, rhubarb, purgation, santonin may lead to errors.

Guaiacol Test. A mixture of tincture of guaiacol and old oil of turpentine is poured as a layer of 5 cc. of acid or acidulated (with acetic acid) urine. After several minutes a blue zone becomes visible at the point where the fluids meet. Or 5 drops of tincture of guaiacol and 20 of oil of turpentine can be added and the open test tube shaken well and allowed to stand. The entire liquid then turns bluish. The test is delicate and dependable.

Benzidin Test.—Into a test tube put a pinch (knife point) of pure benzidin with 1-2 cc. glacial acetic acid and mix with 2-3 cc. hydrogen peroxide; then add to this 3-5 drops of the acid urine to be tested or have the urine slightly acidulated with acetic acid. If blood pigment is present the fluid will change to green, appearing bluish in proportion to the amount of hæmoglobin present—the greater the content the more bluish. This discoloration occurs almost instantly and changes to a dirty dark violet within fifteen minutes. The test may also be made in layers and is very sensitive.

Spectroscopy.—The spectroscopic examination is made by means of an ordinary pocket spectroscope, according to Vogel or Browning; it may be necessary to dilute the urine slightly with water if too concentrated. The position of the absorption band is determined by means of the comparison prism fastened to the spectroscope or by the normal sun-spectrum shown by the instrument. In order to secure a uniform spectrum it is advised to change the various blood coloring matters contained in the urine into carbohæmoglobin by introducing carbon monoxide (in illuminating gas). Its spectrum resembles in the main that of oxyhæmoglobin. The spectroscopic method of testing for blood in the urine is not very sensitive.



Red Orange Yellow Green
FIG. 99.—Spectrum of urine in hæmoglobinuria.

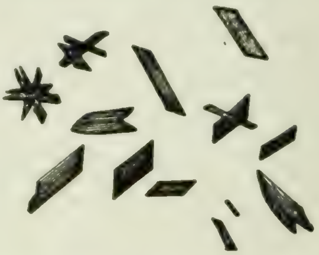


FIG. 100.—Hæmatin crystals.

Microscopical examination alone will positively determine the presence of blood cells, determining whether it is a case of hæmaturia or hæmoglobinuria.

Hæmaturia is indicated by the presence of red blood corpuscles in the urine, and if the urine has been allowed to stand some time contracted or broken down blood corpuscles may be found and the red coloring matter disappears. This condition is present in all diseases of the kidneys.

If red blood corpuscles are not present then it is a matter of hæmoglobinuria or a mixed form. A further differentiation is that the urine in hæmaturia is of a redder (pale to dark red) color, turbid and opaque with a greater admixture of blood and clears after standing with a sediment forming at the bottom; in hæmoglobinuria the urine appears more brownish (brownish red to black-brown or simply discolored), is transparent and lays in layers and in general retains its characteristic properties upon standing. The causes of hæmoglobinuria have been mentioned previously.

Hæmaturia is found in all diseases of the kidneys, such as acute nephritis, acute renal stasis, hemorrhagic infarction, traumatisms, tumors of the kidneys, diseases of the urinary passages, particularly the pelvis of the kidney, pyelitis, nephrolithitis, eustrongylus gigas, and in diseases of the bladder, such as cystitis, neoformations, calculus, inflammation of the prostate and urethra. Furthermore, blood coming from the female sexual organs, e. g. during period of heat (menstruation) might become mixed with the urine while being voided and thus create the illusion of a true hæmaturia.

The location of the hemorrhage may be indicated in the following manner:—If from the kidney, by the presence of large quantities of epithelium and cylinder casts, while the absence of casts and the presence of epithelium peculiar to the bladder, would indicate it came from that organ. If the urine is bloody at irregular intervals, it indicates hemorrhage from the pelvis of the kidney. When the blood is not mixed with the urine, but comes down in a mass, the diseased condition must be in the bladder. This indication is not always certain, as we may see the blood evenly mixed with the urine in diseased conditions of the bladder, such as cystitis. When the blood is passed just before the urine or follows after the last of the urine has passed, or is passed involuntarily, it indicates hemorrhage from the prostate or urethra. In case of a hemorrhage from the female sexual organs it can easily be determined by a direct examination of the organs; furthermore, urine removed by catheterization contains no blood. Hæmaturia may result from certain infections or constitutional diseases, or as a result of the presence of certain filaria in the blood.

c. White Blood Corpuscles, Pus.—White blood corpuscles are found in the urine and are found associated with red blood cells; they are also found in the majority of diseases of the kidneys and urinary organs. When a considerable quantity of pus is passed, polynuclear leucocytes or "pus bodies," it indicates purulent processes in the kidneys in the urinary passages or neighboring sex organs, especially the opening of an abscess in the prostate. If the leucocytes are associated with red blood corpuscles, it indicates a hemorrhage or hemorrhagic inflammation in these parts. When a smaller quantity is present it indicates the presence of some inflammation of the mucous membranes of the kidneys. When the leucocytes occur individually we generally have a condition known as "mucous bodies" which may appear in normal urine. We can obtain definite information as to this condition by making a microscopical examination of the epithelium to see whether any cylinders are present or not.

d. Fat may be seen in drops on the surface of the urine or shortly after it has been passed. In very fat animals this may be seen as a normal condition, and where animals have had large quantities of fat given to them. It also indicates the fatty degeneration of epithelium of the kidneys. Friedberger and Frohner have seen a pathological lipuria associated with croupous pneumonia in animals with certain anemic and cachectic conditions. It is also present in the various diseases of the kidneys. Do not be misled, when you have passed a well-lubricated catheter and see oil floating on the urine, into thinking that it is a pathological condition.

e. Epithelium and Broken-down Tissue.—In health a few epithelial cells are always passed, but when they are present in large quantities it indicates some active inflammation going on in some part of the urinary tract, and a microscopical examination of the cells to ascertain their size and shape will indicate the section of the urinary system they come from. Large quantities of squamous epithelium indicate an irritable condition of the bladder, but it may also come from the ureters or pelvis of the kidney and sometimes, when the urine is that of a bitch, from the vagina. Renal epithelium in any quantity worth mentioning indicates disease of the kidney; single large round glandular cells, mixed with quantities of pus corpuscles and pus-cocci bacteria, indicate disease of the prostate. Broken-down tissues in the urine indicate renal tumors, suppurative or septic nephritis, severe inflammatory processes of the prostate or bladder, or carcinoma of the bladder, etc. (Fig. 101).

f. Renal Cylinders.—Those forms which have been identified up to the present in the dog and which can only be recognized by means of a microscope are more or less cylindrical structures and are illustrated in Fig. 101. Where we find hyaline cylinders, granular cylinders, epithelial cylinders, or blood casts, then we can feel assured that there is some disease of the kidneys. Blood cylinders indicate hemorrhage of the kidneys or hæmorrhagic nephritis. Epithelial cells in large numbers indicate great desquamation of the epithelium, if the kidneys, especially as in acute parenchymatous nephritis. Hyaline or epithelial cells when mixed with many pus cells indicate suppurative nephritis. Hyaline and granular cylinders mixed with other forms are present in all diseases and the kidneys and often occur alone in contracted kidneys, congestion of the kidneys, certain intoxications, in albuminuria and fevers (Fig. 102).

g. Bacteria, Vegetable and Animal Parasites.—Bacteria found in recently voided urine or in urine taken with a clean catheter always indicate a pathological condition and may come from the kidneys and urinary tract or neighboring sex organs (prostate, vagina, uterus), also from other organs as, for instance, from the intestines being carried by the blood to the kidneys and through them to voidance. Vegetable parasites may be found in recently voided urine in the form of the split fungus, side by side with triple phosphates (Fig. 103). Siedamgrotzky found numerous ball bacteria and pus corpuscles in suppuration of the prostate. Lumps or masses of bacteria or bacterial cylinders (Marek) formed by pressing together cocci or bacilli, generally have their origin in the kidneys or kidney calyx; staphylococci and streptococci are found oftener in inflammatory conditions of the urinary tracts than in suppurating nephritis; isolated bacteria (staphylococci, streptococci) may occasionally occur in the urine with no evident changes of the urinary organs (Marek). Animal parasites that may be found in the urine are either the eggs of the Eustrongylus Gigas,

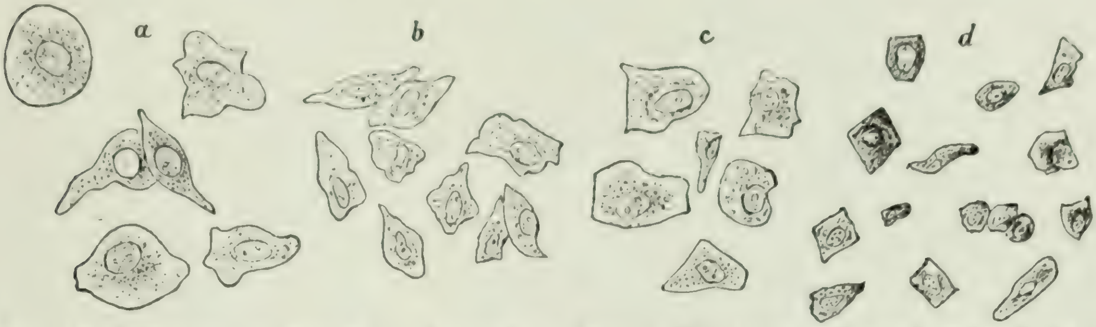


FIG. 101.—Epithelium found in the urine: *a*, from the bladder; *b*, from the ureters; *c*, from the pelvis of the kidney.

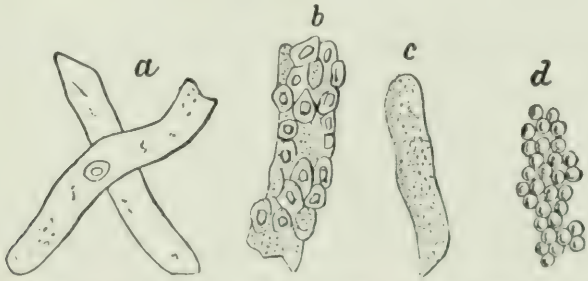


FIG. 102.—Uric cylinders: *a*, Hyaline cylinders; *b*, epithelial cylinders; *d*, granular cylinders; *c*, blood cylinders.

parasites in the renal pelvis, the eggs of Trichosoma Plica, or the embryonic forms of the Filaria Immitis.

h. Crystals.—We find collections of precipitates in the urine and indications of alkaline fermentation, the urine being alkaline in reaction and containing crystals, the only ones of practical interest being those of triple phosphate, phosphoric acid and ammoniacal magnesia; these crystals are not found normally in freshly voided urine but always form when the urine is allowed to stand exposed to the air and develop in ammoniacal urine. If they do appear in fresh urine their presence indicates ammoniacal fermentation in the urinary passages, as after cystitis or pyelitis. Zirker, however, has established that they do occur in the urine of healthy dogs. If they occur in larger quantities it is always pathological. These crystals are coffin-shaped, they are soluble in acetic acid, thus being distinguished from calcium oxalate, and occur in large quantities in chronic cystitis. Other crystalline admixtures found are the crystals of Sodium Urate which are most apt to occur in concentrated urine and upon cooling the urine precipitate as reddish yellow "sedimentum lateritium." There are a number of abnormal substances found in the urine. The principal ones are albumin, sugar, and the coloring substances of the bile.

i. Albumin.—The presence of albumin in the urine is always an indication of disease even though, according to evidence established by Simander, Lüth and others, very small quantities of albumin (about 0.01%) do occasionally appear in the urine of perfectly healthy dogs. The two most important forms of albumin are serum-albumin and serum-globulin; the two are generally in combination, and both give the same reaction.

Koch's Test.—The urine to be examined must be carefully filtered before proceeding with the test. The urine is boiled in a test-tube, if necessary having been previously rendered acid in reaction by the addition of a small quantity of acetic acid. The urine may become opaque from two causes; from the presence of albumin or from phosphates; to this we add nitric acid drop by drop until the phosphate is all dissolved and the albumin remains opaque.

The occasional change in the color of the urine resulting from the addition of the nitric acid is due to the action of the acid on the coloring matter of the urine and is of no importance.

Heller's Test.—The urine is rendered acid, if not so already; then pour a small quantity of nitromuriatic acid down the side of the tube, and if there is any albumin present there will be a pronounced white opaque ring or line where the acid meets the urine.

If the albumin content of the urine is high, then the ring at line of contact is wide and dense; if low, then narrow and thin; its appearance at the exact point where the acid and urine meet and its decided termination upward and downward prevent any errors. With a minimum albumin content only a delicate cloud will appear. The formation of several colored rings has nothing to do with albumin.

Test with Acetic Acid and Ferrocyanide of Potassium.—The urine is rendered acid with acetic acid and drop by drop a 5 to 10 per cent. solution of ferrocyanide of potassium is added; if albumin is present, a yellowish white precipitate indicates the presence of albumin. If the solution immediately becomes turbid on the addition of a very small quantity of the solution it is due to the presence of mucin and must be filtered immediately before proceeding. Very concentrated urine must be diluted with a certain quantity of water.

The quantitative test for albumin may be made by allowing the precipitated albumin obtained by the "Koch's Test" to stand over night and settle, and then on the following day comparing the deposits thus secured to determine the state and course of the disease. It is also possible, through practice, to reckon approximately the amount of albumin by the intensity of the turbidity or the height of the deposit. The more accurate quantitative test for albumin must be made by means of an Esbach's albuminometer. As a rule the simple proof of the presence of albumin is sufficient for diagnostic purposes.

For the test with the albuminometer the urine to be tested must show acid reaction, must not be too concentrated, diluting first if necessary (best with 9 volumes of water so that the albumin content can later be read in percentage). A solution of 1.0 picric acid and 2.0 citric acid in 100 cc. distilled water will serve as reagent. The cylinder of the albuminometer is filled to the mark "U" (a little less than half) with urine and then the reagent is poured in until the cylinder is filled to the mark "R" (almost three-fourths of its entire height). After inserting a rubber stopper the contents should be shaken thoroughly and then allowed to stand in the cylinder for 24 hours. The height of the deposit on the scale shows the albumin content of the urine under test to a tenth of a per cent. With carrying on continued tests (a series) it is necessary always to work at the same temperature, and to work under the same conditions.

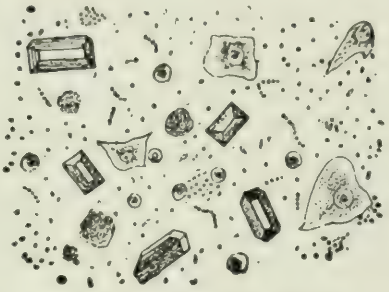


Fig. 103.—Urine of a dog with cystitis, triple phosphate crystals, red and white blood corpuscles, and cystic epithelium. Bacteria.

Albumin occurs in the urine (albuminuria) from two causes: in false or accidental albuminuria, and in true or renal albuminuria.

The first occurs when there is free albumin in the urine from accidental causes (the urine is shown to be free from albumin in the kidneys), as where the albumin is added to the urine in its passage through the urinary passages from hemorrhage, inflammatory conditions in the passages, or from purulent inflammations. In such cases the microscope will easily make the differential diagnosis. The quantity is always small.

True albuminuria is of much greater importance, as this condition is always a symptom of pathological alterations in the epithelium covering the walls of the gland. Healthy epithelium will always retain the albumin in the blood.

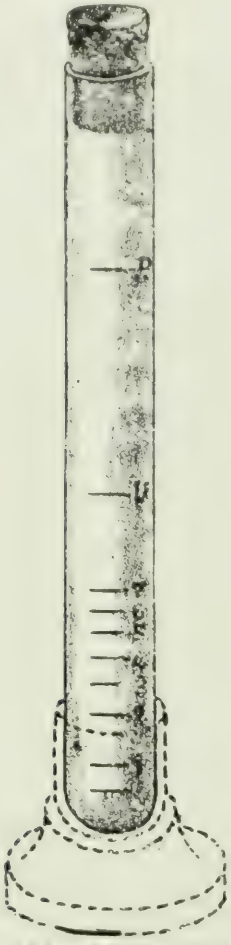


FIG. 104.—Albuminimeter.

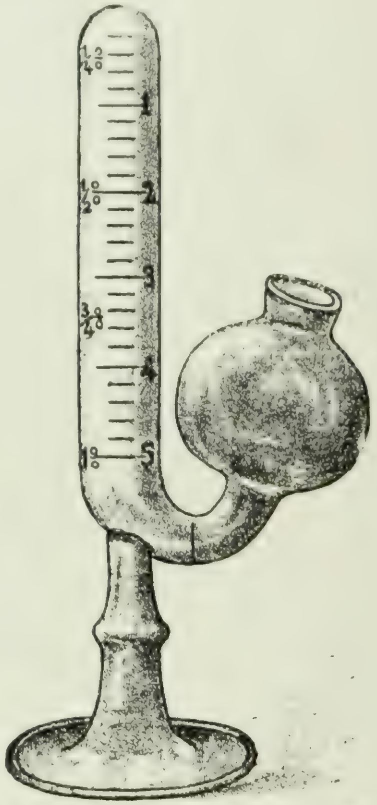


FIG. 105.—Fermentation saccharimeter (*Einhorn*).

We see true albuminuria in all forms of acute and chronic inflammation of the kidneys, in fatty degeneration of the kidneys, in amyloid kidneys, and in any altered condition of the renal circulation, such as stagnating hyperæmias as a consequence of heart disease, and in chronic inflammatory conditions of the lungs, pleuritis, hydrothorax. The horizontal position of the dog does not, however, cause such a great disturbance in the posterior extremities when the smaller blood vessels are congested as it does in man.

Albumin will sometimes be found in the blood from anaemia, leukaemia, piroplasmosis, trypanosomiasis, filariasis, haematuria, haemoglobinuria, in acute poisoning, and from high fevers, especially in acute infectious diseases, also sometimes in intestinal diseases and finally after violent muscular cramps. In acute nephritis a large amount of albumin is found to be preesnt, in smaller quantity in chronic nephritis, while in acute atrophy of the kidney very little and sometimes no albumin may be found, but in the latter condition we generally find that there is present more or less nephritis or a slight parenchymatous degeneration of the kidneys. And it is well to examine the urine under the microscope to see if cylinders are present.

Albumosuria, which is of much less importance than albuminuria, is, however, usually associated with albuminuria and may appear in metabolic diseases, leucaemia, excessive disintegration of leucocytes in abscesses, lung cavities, etc., in certain forms of poisoning, as with phosphorus and in other conditions. Any further information concerning this subject and the chemical test for albumose in the urine see special books treating this subject.

j. Sugar.—The grape-sugar test is generally made when an animal has a good appetite and polyuria and yet becomes generally emaciated, and when the urine is pale but of a high specific gravity.

The tests are Trommer's, the bismuth, and the fermentation test.

Trommer's Test for Sugar.—Put a few cc. of urine in a reagent glass, taking care to first see that there is no albumin in it, and if so coagulate it and filter it out. Take the urine and dilute it with an equal bulk of water, and render it alkaline with a small quantity of sodium hydrate or potassium hydrate; then add drop by drop a 5-10 per cent. solution of cupri sulphas until the liquid is clear and the sediment dissolved, then heat it until it boils, and if sugar is present we see a reddish-yellow vapor appear at the surface of the fluid and gradually spread over the entire fluid.

Bismuth Test.—Ten parts of urine from which all albumin is removed has the following solution added to it: bismuth subnitrate 2 parts, Rochelle salt 4 parts, and a hundred parts of 10 per cent. solution of caustic soda; this mixture is boiled five minutes, and if sugar is present the mixture becomes black.

Fehling's Test.—This test is somewhat more troublesome, but in general more reliable and recommended to those who have not had much practice. The Fehling solution necessary for this test cannot be preserved, and it is therefore necessary to keep the two original solutions that form it separately—i. e. (a) 3.5 gm. copper sulphate in 50 cc. of water, and (b) 17.5 gm. potassium sodium tartrate, 5.5 gm., caustic soda in 50 cc. water. Just before beginning the test mix equal parts of these solutions (a) and (b). The resulting solution (Fehling's Solution) is clear and deep blue and is then mixed with an equal quantity of urine (each 5 cc.) in a test tube and heated. The result is the same as with Trommer's Test. A very low sugar content is often not recognized until some time later when the red precipitate of copper oxide is found deposited on the bottom of the test tube.

A modification of Fehling's test is suggested by Worm-Mueller as follows: Heat separately to boiling point 5 cc. of urine and about 3 cc. Fehling's Solution; after allowing to cool 25 seconds, mix with one another. If sugar is present, copper-oxide will deposit in 5-10 seconds.

Phenylhydrazin Test.—According to Eschbaum 5 drops phenylhydrazin, 20 drops of glacial acetic acid and 50 drops urine are to be mixed in a test tube, which is then gently cooked for one minute. After that add 22 drops officinal solution of caustic soda, bring to a boil again and let stand for several hours. Microscopic examination of the sediment will reveal yellow needles of phenylglucosazon arranged in bunches. Other rapid tests suitable for dogs are the Merckschen reagent tablets, which is merely a variation of the Fehling's test, the Safranin test and the Nitropropiol test. The last is declared unsatisfactory by Dolz since it sometimes tests positive, even with normal urine. This same is true of the Bismuth test, according to Nylander-Almen, so frequently used in humane practice.

Fermentation Test.—This test is always to be preferred in dubious cases; it is also useful to determine the quantity of sugar present. In this test the Einhorn saccharometer (see Figure 105) is used. The method consists in adding a small quantity (size of a bean) of fresh compressed yeast to a certain proportion of urine. The tube is then filled with this mixture in such a way that no air bubbles are present in the upper sealed side arm. The shutting off of the lower bend by pouring in mercury is usually unnecessary. The apparatus is now allowed to stand at medium room temperature for 12-24 hours. After that time the scale will show whether any carbonic acid gas has formed and how much or what percentage of sugar that carbonic acid represents. Since the Einhorn's apparatus registers only 1% sugar the urine must at times be diluted correspondingly. The fermentation saccharimeter of Lohnstein works upon the same principle—it should be used in cases when more accurate results are desired.

In diabetes mellitus a large quantity of dextrose or grape sugar is generally found in the urine. This disease, however, is extremely rare in the dog. Glucose is found more or less temporarily in glycosuria which has been observed in certain poisonings, in certain disturbances or diseases of the nervous system and in certain infectious diseases, e. g. piroplasmosis. In glycosuria we must include rabies glycosuria, which was discovered by Porcher in 95% of the cases of rabies examined by him. It is also found when the animal has been fed on a pure sugar diet, or on a diet of meat and sugar (alimentary glycosuria). A considerable amount of sugar has been found in the urine of bitches that were nursing, especially when the pups were prevented from nursing for some time.

In this last case, however, it is not dextrose but lactose (lactosuria). Final mention must be made of the fact that after complete extirpation of the pancreas, severe diabetes follows, and when only partly removed the diabetes is milder.

k. Coloring Substance of the Bile.—The coloring substances of the bile are found quite frequently in the urine of the dog and must be looked upon as a pathological symptom even though there is no evident general disturbance. The presence of these indicates an obstruction in the excretion of bile. It may often be seen in catarrh of the intestines and in the gastric form of distemper. Icterus is the most common cause of this condition. (For further information, see icterus.) Frohner found this also in neurosis and bronchial forms of distemper, in some diseases of the kidneys, in pleuritis, and in great heart weakness. Voigt also found it in animals that were starved. Bile acids in the urine are of no diagnostic value in the dog, and will not be taken up in this work.

The various methods of testing for bile pigments that are especially suited for practice are: Gmelin's or Rosenbach's Test, Hammarsten's and Rosin's Test.

Gmelin's Test.—A small quantity of nitric acid is poured into a test tube; add to this one or two drops fuming nitric acid, and then carefully pour urine on to this. This can be done best by slowly pouring the urine out of another test tube held at a slant, pouring it along the inside of the first test tube, also held at an angle. At the point of contact of the two fluids colored rings form, but only a green ring is indicative of the presence of bile pigments.

The **Rosenbach** Modification is more exact than this test. A larger quantity of the urine to be tested is filtered through a medium sized filter paper. After the rest has drained off the paper should be touched with the mixture mentioned above, nitric acid and fuming nitric acid. The colored rings, of which only the green one is diagnostic, appear on the filter paper.

Hammarsten Test.—A mixture of 19 vol. 25% nitric acid is allowed to stand at room temperature until it has become yellowish. This reagent is mixed in a test tube with four times the amount of alcohol; to this is added 2-3 cc. acid urine, which immediately after shaking shows a pretty, green coloration. If the content of bile pigment is low and of other coloring matter high, then 10 cc. of the urine are replaced by several cc. of a solution of barium—or calcium chloride, centrifuged, the fluid decanted from the sediment and this covered with 1-2 cc. of the reagent.

Rosin's Test.—Carefully pour layer-like as described above, 10-15 cc. urine in a test tube with tincture of iodine diluted ten times. Where the two fluids meet a green ring will form. Better results are secured by the Modification of Obermayer and Popper. For this use a mixture of 3.5 cc. tincture of iodine (1:10) 12 gm. potassium iodide, 75 gm. sodium chloride, 125 cc. alcohol (95%) and 625 cc. of water. This mixture is poured into the test tube under the urine, by carefully permitting the mixture to flow through a pipette that reaches to the bottom of the test tube. A blue or green zone develops where the two fluids met.

e. Indican.—Traces of indican are found in every urine and can often be detected by simple clinical test methods in apparently healthy dogs. Its source is as follows: The albumin in the intestines disintegrates in the digestive process in the intestines and forms, among many other bodies, indol. This is reabsorbed and then voided again with the urine in the form of indoxyl potassium sulphate, i. e. indican. If indican appears in increased quantity in the urine, it indicates excessive decomposition in the intestines; on the other hand putrefaction processes in other parts of the body may cause a decided increase in the indican content of the urine. A decline in such cases is to be considered favorably from a prognostic standpoint.

The methods of Jaffé and Lassar-Cohn for determining the presence of indican are especially easily carried out.

Both change the indican in the urine to indigo and make it visible through employing chloroform.

Indican Test According to Jaffé.—Fill a test tube one-third full with urine, adding an equal amount of concentrated hydrochloric acid, 1-2 drops of a freshly prepared solution of chloride of lime and 1-2 cc. chloroform. Shake this mixture thoroughly and let stand. The chloroform that collects in the bottom of the tube will show a blue color if indican is present, the blue becoming more intense in proportion to the amount of indican contained in the urine.

Indican Test According to Lassar-Cohn.—Prepare a supply of hydrochloric acid containing iron chloride as follows: Dissolve 0.5 of solid iron chloride in 125.0 hydrochloric acid having a specific gravity of 1.19 (= 36% HCL-content). For testing fill a test tube one-half with urine and almost one-half the same amount of the above mentioned hydrochloric acid containing iron chloride and about 2 cc. chloroform. After frequent careful shaking the chloroform will turn blue (see above).

An increase of indican in the urine is found in acute and chronic catarrh of the intestines, overloaded stomach, constipation, foreign bodies, tumors or displacement of the intestines, as well as in the presence of larger putrid centers in the body (gangrene of the lungs). A decrease of the indican in the urine appears in acute diarrhœa and after administering of the laxatives.

DISEASES OF THE KIDNEYS

Inflammation of the Kidneys; Nephritis

It is impossible to accurately separate the different inflammatory conditions of the kidneys, and as a rule it is only on post-mortem that the condition can be properly diagnosed. Consequently, the practitioner has to be satisfied if he can recognize with certainty that the animal has some affection of the kidneys, and whether it is acute or chronic. In the dog it is only in chronic nephritis that we find a general atrophy of the kidney.

Acute inflammation of the kidney may be traced to severe cold, to traumatisms, or to sympathetic irritation from adjacent organs, or to acute catarrh of an infectious or toxic character.

The diseases of the kidney in the dog do not possess that importance that they do in man.

Acute Inflammation of the Kidneys

(*Acute Nephritis; Nephritis Acuta.*)

Etiology.—The most common causes of this condition are infectious diseases and poisons. By this is meant the effect produced by the absorption of infectious noxious agents, such as the various septic diseases, or certain irritants that have originated in the body and are passed into the kidneys and cause great irritation while they are passing through these organs, and also certain micro-organisms that multiply here and cause inflammation or while passing through the kidneys reach the blood and become located in the capillaries of the kidneys, injuring and obstructing them. Certain chemical substances, such as phosphorus, arsenic, lead, mercury, copper, cantharides, turpentine, colchicum, squill, digitalis, filicic extract, mustard, resin, pyrogallol, male fern extract, strong spices, carbolic and tar acids, naphthol, and chrysarobin, that are absorbed or taken into the stomach pass through the kidneys and cause great irritation. Some of these chemical substances are absorbed by the skin from various ointments that are applied in mange, such as carbolic acid, mercury, cantharides, balsam of peru, storax, etc.

Acute nephritis may also originate from an extension of inflammation from neighboring organs, as from the bladder or kidney pelvis, and also from traumatic influences, such as blows, shocks, etc., in the regions of the kidneys. There is a condition called rheumatic inflammation of the kidneys that is supposed to originate from cold. This occurs generally in young dogs during severely cold weather. On the basis of clinical observations there appears to be a possibility that nephritis may follow severe colds occurring after jumping in ice cold water, delicate dogs becoming thoroughly wet.

Pathological Anatomy.—The alterations in the structure of the kidney depend on the intensity of the irritation, and the alterations are more or less distinctly marked. In slight cases the epithelium seems to be the only part affected (cloudy swelling, fatty degenerations or nurosis), the connective tissue and the blood vessels show no pathological alteration other than a reddish-gray coloration of the covering, or sometimes a yellowish coloration (parenchymatous degeneration). When the irritation is great, there is true parenchymatous inflammation of the kidneys. The epithelium and the intermediate tissue become affected, as do the blood vessels, and all the exudation processes which accompany follow acute nephritis. The anatomical alterations that are found are as follows. The epithelium has undergone extensive desquamation (often a more or less complete desquamation has been undergone by the epithelium), as in parenchymatous degeneration, but more acute in its type. The capsules of the glomeruli and the small urinary canals, and the connective tissues are filled with a liquid infiltration (rich in fibres) forming numerous coagulated masses containing large numbers of leukocytes rich in hydrogen and the urinary canaliculi (Henle's loop and straight tubules) are often filled with hyaline and epithelial cylinders. The vessels are enlarged (hyperæmic) but sometimes partially compressed by the surrounding inflammatory exudates. In the interstitial tissue, within the uriniferous tubules and even in Muller's (Bowman's) capsule we find small circumscribed hemorrhages. There are a number of circular-shaped inflammatory centres surrounded by liquid exudates.

The inflamed kidney may present a variety of different appearances, depending upon whether these inflammatory processes have spread uniformally over the entire kidneys or have appeared only in a focal manner; also depending upon whether the exudate given off was more liquid or more cellular and finally upon whether the appearance of blood was very noticeable or not. It may be enlarged or normal in size, soft or comparatively hard, reddened or very pale or yellowish-white, and on the surface of the kidney there may be found a number of hemorrhage spots that are slightly elevated from the surface of the gland. The capsule can easily be stripped from the body of the kidney. There are certain forms of acute nephritis, glomerulonephritis, and focal nephritis that present so little visible changes that they may escape the eye of the non-experienced practitioner. Concerning more accurate details refer to the various text-books on pathological anatomy, particularly Kitt, who has made a special study of the pathological anatomy of domestic animals.

Clinical Symptoms and Course.—Slight acute inflammatory conditions of the kidneys are rarely recognized in the dog, as the only diagnostic points are to be found only on examination of the urine. This contains a small amount of albumin, some hyaline cylinders, and a few epithelial cells and leukocytes.

In severe acute inflammatory conditions the animal has a peculiar stiff gait in walking, and in some cases staggering, with the hind legs carried straight, and tenderness, usually evinced by cries of pain, on pressure in the regions of the loins; there may be pain on pressure in the region of the kidneys, and an exact knowledge of the anatomy will aid to discover whether these organs are enlarged; a quick full pulse, with loss of appetite, but usually a desire for drink, and sometimes vomiting and fever at least in the early stages of the disease; great lessening in the amount of urine secreted, and what is passed is dark in color and contains small portions of coagulated blood, but the animal may make frequent attempts to urinate, and the fæces are small in quantity, dry and hard. The amount of urine passed in such conditions is small although the animal frequently makes attempts at urinating while standing with the lumbar region rigid and contains a large amount of albumin. In very severe cases anuria may appear for days at a time. The urine is turbid, almost always more or less bloody, reddish-brown to dark red in color; if allowed to stand there is a thick mucus-like sediment of red or a red-brown or, in rare cases, opaque red color, and the specific gravity is greatly increased; examined microscopically, it is found to contain urinary casts of various kinds, renal tube-cylinders, epithelium, and white blood corpuscles, also red blood corpuscles, which give the urine a variable color, according to the number of corpuscles present; chemically tested, large quantities of albumin are found to be present. There is generally more or less pain on urination; this is probably due to the acrid condition of the urine. There are also present more or less symptoms of uræmia, with great weakness, fatigue, and temperature generally subnormal, the pulse weak and thready, vomiting, diarrhœa, œdema of the limbs, convulsions, coma, and death. There is no doubt that part of these symptoms are to be recognized as uræmic symptoms. Pathological changes of the retina may also occur in all kinds of severe acute and chronic nephritis and were identified by Seibel in one case of atrophy of the kidneys (see later) by dissection. The result in an acute case is not often favorable if the disease lasts from 8 to 14 days. When the symptoms are milder and the animal recovers, this is indicated by an increase in the amount of urine secreted and its becoming clearer; but this condition may be followed by chronic nephritis.

Therapeutics.—Medicine, as a rule, has little or no effect on these cases. Tannin, 0.1 gm. several times daily; tinct. fol. uvaursi, 1.0, or fuchsin, and iron and lead preparations may all be used. All of these were formerly used to a great extent in acute nephritis, but have been found to be but of little, if any, help.

The dietetic treatment is the most successful and consists principally of rest (the patient should remain in a warm room and kept quiet) and food that is non-irritating to the kidneys, such as milk, mutton broth, rice and gelatine soups, are especially useful. Meat may be given, but never in the severe acute stages, and otherwise only lean meat and in spare quantities, avoiding anything that is spiced or salted. The symptomatic treatment is to try to lessen the strain thrown on the kidneys by trying to carry the fluids out of the body by some channel other than the kidneys, and we try to do this through the skin or the intestines. This can be accomplished to a certain extent by giving the animal hot baths (30-40° C.) or using warm bandages (the Priessnitz compress) around the body, particularly around the kidneys, and also by active purgatives which have no action on the kidneys, such as cascara sagrada, senna leaves (Electuarium e Senna, by the tablespoonful), aloes, rhubarb, jalap and calomel. Where there is great pain in the region of the kidney and the animal moves about with the back arched, the application of a warm linseed or fango poultice in the region of the kidneys is particularly useful.

To relieve the kidney we can also try pilocarpine, which produces great salivary secretion in the dog. This, however, must be used with great care in dogs that have any affections of the heart or lungs, or if any symptoms of a weak heart are present. Diuretics must not be used in nephritis, as they increase the secretion of salts, especially the alkalies. Of all the diuretics that may be recommended only such should be used which positively do not irritate the kidneys, e. g. potassium and sodium aceticum, tartarus depuratus, borax, with care also diuretin, agurin and theocin. General debility should be treated by alcoholic stimulants, such as brandy, whiskey, or sherry, in the case of very small animals. Weak hearts should be treated with cardiac stimulants. Use inhalations of chloroform, clysters of chloral hydrate, or salts of bromine to counteract convulsions. Where acute enphritis occurs as a result of some infectious or toxic disease, the symptoms must be treated in connection with the exciting cause.

Chronic Inflammation of the Kidneys.

(*Chronic Nephritis; Nephritis Chronica.*)

Etiology.—Chronic nephritis originates, as a rule, from acute nephritis, especially from the comparatively milder forms, or starts in a mild form and gradually becomes chronic; this is seen particularly when it originates from similar causes as acute nephritis, as from toxic or infectious causes, and in animals that are subjected to repeated colds or lie in damp kennels, so that it is very difficult to tell at times just how a chronic case may originate.

Pathological Anatomy.—There are two forms of chronic inflammation of the kidneys; first the large white kidney (chronic parenchymatous nephritis), and the atrophic or hard kidney (chronic interstitial nephritis). The first condition is generally the forerunner of the second, but, as the hard kidney is most frequently found in post-mortem, it is possible that it may develop as a primary condition. The white kidney is enlarged from the normal size, and has a smooth or irregular yellowish-white, gray white or grayish yellow colored surface. The cortical portion is yellowish in color, while the pyramids are red. In some cases we find the kidney large and red, or alternated red and yellow, or covered with hæmorrhagic spots. The consistency is usually firmer than normal, the capsule as a rule decidedly adherent. Chronic interstitial nephritis or atrophic kidney (shrunken or contracted kidney) results from an increase of the interstitial substance and atrophy of the parenchymatous substance. The kidney appears smaller, is hard and tough on its surface, and has small, wart-like irregularities and granulations. The capsule is thickened and it is hard to strip from the body of the kidney, adhering particularly to the drawn in shrunken parts; here and there we find small cysts of various sizes. The cortical substance is lessened in diameter and striated with layers of dark colored tissue, and the pulp part is somewhat smaller and not intact. The pyramids are smaller and deep red in color.

Clinical Symptoms and Course.—As a rule, very little concerning the more exact symptoms of chronic nephritis—atrophy of the kidney is meant chiefly—can be recognized in the dog during life. The quantity of urine is greatly increased and passed at much shorter intervals; this increase of the amount of urine passed is one of the first symptoms to attract the attention of the owner. The urine is very light in color, almost like water, the specific gravity being much lessened. Microscopically examined, we may find isolated hyaline cylinders, renal epithelium, and a few blood corpuscles; albumin is never present in any great amount, frequently for a certain period small quantities of albumin may be present and then it entirely disappears. The animal's thirst always increases. Palpation of the kidney may find it hard, smaller, and uneven on the surface. In such cases there is generally hypertrophy of the heart, generally of the left ventricle, which can be recognized by palpitation of the heart (loud pulsations and a hard, full pulse). It is presumed that this high arterial pressure tends to keep up the action on the impaired kidney and prevent any serious disturbance in the secretion of the kidney. As the disease advances we soon recognize a change: the heart becomes weaker in its action, the pulse is small and frequent and often irregular, breathing becomes difficult and the urine is scant, dark with higher specific gravity, and very albuminous. This is followed by œdematous swellings of the pendent parts of the body and by chronic inflammatory processes in various organs, especially the bronchia, and in the intestinal canal;

and finally we have symptoms of uræmia. In the majority of cases the parenchymatous form can be recognized by the urine. This is very similar to acute nephritis. It contains much albumin, and the urine is scant in quantity, and there are certain dropsical symptoms in the dependent regions; death may occur as a result of general dropsy or uræmia, or such complications as pneumonia, pleurisy, or pericarditis. There is also loss of appetite, great fatigue on taking any exercise, hypertrophy of the heart, which finally becomes weak, and then symptoms of uræmia follow as stated above. In rare cases the condition may change and the active symptoms cease; the chronic parenchymatous nephritis changes to interstitial nephritis; the urine gradually becomes clean and of a lighter specific gravity, it increases in quantity and the dropsical regions return to their normal condition.

Therapeutics.—The treatment of chronic nephritis is in general the same as in acute. As the course of the disease generally covers a long period and the affected animal suffers great loss of strength, the animal must be fed frequently on milk, rice, or meat, being careful to use no salt or spices. But the dropsical conditions can be treated by diuretics and aromatics; pilocarpin is also sometimes used, and when there is great anæmia give iron salts to assist absorption of the pathological neoformation resulting from the inflammatory processes. Iodine, iodide of potassium, or sodium may be administered for absorbing the masses of connective tissue that have collected in the kidneys.

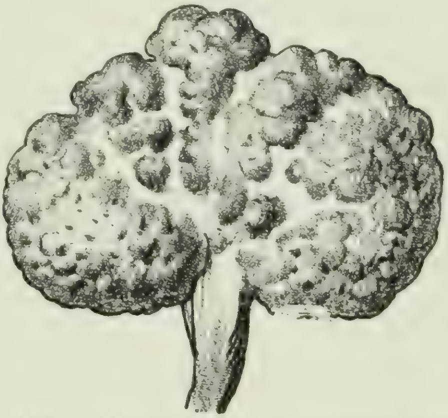


FIG. 106.—Atrophied or contracted kidney.

Other Diseases of the Kidneys.

There are in the dog a number of pathological conditions of the kidneys which are of very little importance; the most important of these will here be described briefly.

Renal Hyperæmia.—This follows as a result of arterial hyperæmia (active renal hyperæmia, renal congestion), and may be produced by the same causes as produced acute nephritis; frequently certain diseases of the circulatory or respiratory organs, interfering with the venous circulation, produce passive hyperæmia of the kidneys (renal stasis). Thrombus in the renal circulation or tumors pressing on the vessels may also cause it. In renal congestion there is a large amount of urine secreted (polyuria), which is light in color, thin, and of a low specific gravity, whereas in renal stasis the urine, decreased in quantity, is of high specific gravity, dark in color and contains a certain amount of albumin, sometimes hyaline cylinders and isolated blood corpuscles in small amount. The urine after standing some time forms a thick red precipitate of urates, which are readily redissolved by heat.

The treatment of active renal hyperæmia consists in endeavoring to remove the active cause of the hyperæmia by treating the primary affection.

Amyloid Kidney.

Amyloid kidney generally occurs in connection with amyloid degeneration of some other organs of the body. The kidney is slightly increased in volume, firm, smooth, with yellowish-white coloration of the cortex, and in the parenchymatous form the condition can usually be recognized by the character of the urine. This generally presents the same symptoms as those of acute nephritis. The urine is loaded with albumin and much lessened in quantity.

The amyloid condition is seen not only in the kidneys, but also in the liver, pancreas, and intestines.

Pathological Anatomy.—A kidney thoroughly affected with amyloid disease is slightly enlarged, hard, smooth, and shows at the intersections a deep yellowish-white coloration, easily distinguished on section. The glomeruli are easily distinguished with the naked eye as small glossy spots. On staining with Lugol's solution the affected parts are colored a mahogany-brown and with methyl are colored purple-red. For further details see works on pathological anatomy.

Clinical Symptoms.—The extremities are dropsical, with complete loss of appetite, emaciation, unsteady gait, œdema, albuminuria, vomiting, decrease in body temperature, coma, uræmia, and then death. In a case where the animal was unsteady and weak, with paleness of the mucous membrane, Zimmerman found an amyloid kidney associated with hypertrophy of the left side of the cord.

Therapeutics.—The treatment consists in following what is prescribed in nephritis.

Abscess of the Kidneys.

(Suppurative Nephritis; Purulent Inflammation of the Kidneys.)

Etiology.—The direct cause of the formation of abscess of the kidney is direct injury of the kidneys or in the region of them, causing the formation of purulent abscess in the urinary passages, the bladder, the urethra, or the pelvis of the kidney. In certain cases this condition is associated with ulcerous endocarditis, from the results of an embolus which may be liberated and get into the circulation.

Pathological Anatomy.—Purulent nephritis occurs in various forms, according to its origin. When this condition is caused by an embolus it is seen in the shape of small abscesses which are easily distinguished by the naked eye. When a section is made through the kidney, these abscesses extending along the canaliculi present a peculiar appearance and are grayish-yellow in color, round or oblong in shape, and are generally surrounded by a red circle.

When the spot is examined under the microscope there are swarms of micrococci in the centre of the mass, and it is reasonable to believe that these are the causes of the abscesses. Only in rare cases do the abscesses become confluent, and when they do they form large pus centres that, as a rule, cause death. When the abscess forms in the pelvis of the kidney the pus extends into the straight urinary canals, in some cases as far as the surface of the kidney, and is indicated by a protrusion or elevation of the external surface, which is yellowish in the centre and surrounded by a circle of yellowish points. When large abscesses are formed from these and become confluent, the whole kidney may become altered into one large abscess. The covering capsule of the kidney then becomes thickened and holds the abscess with its contents (pyonephrosis). In the early stages, where the micrococci have just collected in the urinary canals and have started to form abscess centres, a very interesting study is afforded.

Clinical Symptoms.—The symptom of abscess of the kidneys may not differ to any great extent from chronic nephritis, the diagnosis being based on local manifestations, by means of palpation of the abdomen in the region of the affected kidney; this may disclose that the kidney is painful upon pressure, greatly enlarged or even fluctuating if the abscess has formed pus. An examination of the urine may show it to contain numerous pus corpuscles, a large quantity of micro-organisms, and an excess of albumin and pus, blood cylinders, renal epithelium and, in rare cases, we may even find portions of broken-down renal tissue. It is possible, however, to find an acute case in which none of these symptoms are presented and where the urine is practically clear; this is particularly noticeable when the irritation is due to an embolus. The whole appearance of the animal presents all the symptoms of an acute wasting disease; the fever is irregular or intermittent and there is generally rapid emaciation.

Perinephritic abscesses may become so large that they form a tumorlike body in the lumbar region, and the pus can be detected under the skin, in some cases so large that the enlargement fluctuates. When such is the case, and we have confirmed our diagnosis by means of an exploring needle, the sac should be emptied by an aspirator or by making a fairly large opening and emptying the abscess of its contents. It should then be washed out daily with an antiseptic solution. If the kidney itself is not directly affected by the abscess, we may expect a quick recovery under good antiseptic conditions (see treatment of wounds).

Treatment.—If the disease is confined to one kidney, the treatment should be surgical and the abnormal kidney removed, care being taken, however, to be sure the remaining kidney is normal and able to perform the duties of both. As yet there is no way to determine this definitely in the dog. A puncture is only to be made in case of paranephritic abscesses (an incision also) when the result is expected to be successful.

Inflammation of the Pelvis of the Kidney.

(*Pyelitis.*)

Etiology.—This is caused by the irritation or extension of certain inflammations from the body of the kidney, from poisonous irritants passed from the blood through the kidneys, from foreign bodies that lie in the pelvis, from nephritic stones, or strongylus gigas, and this condition is also seen in infectious diseases that are acute in character, as well as in the extension of inflammation from neighboring organs (nephritis, cystitis) and from any of the various conditions that result in interference with the flow of urine, stricture ot the ureters, from the presence of calculi, tumors, or abscesses of the prostate, paralysis of the bladder, as in spinal paralysis, or in hydronephrosis.

Since pyelitis generally appears in conjunction with other diseases, the symptoms are very indefinite.

Pyelitis occurs in a number of forms varying according to the intensity of the irritation and is generally part of other morbid processes. This disease is recognized by means of the microscope, particularly when we discover epithelium of the pelvis of the kidney in the urine, or by manual examination of the kidneys through the abdominal wall, when enlargement of the pelvis may be detected (see also parasites of the kidney), or there may also be present some symptoms of inflammation of the kidney or catarrh of the bladder. The treatment consists in the attempt to remove the original irritant. To disinfect the pelvis of the kidney urinary bladder antiseptics mentioned later on under "cystitis" can be used.

Hydronephrosis; Dilatation of the Pelvis of the Kidney.

Etiology and Pathological Anatomy.—Whenever there is a stenosis or stricture of the urinary passages and consequent obstruction, the urine is dammed back and presses on all the canals behind the point of obstruction, and as a consequence the canals are distended and finally become enlarged. If the obstruction is in the urinary tube, the bladder, ureters, and the pelvis of the kidneys become enlarged; but if one ureter only is affected, the corresponding kidney becomes enlarged; and where the pelvis is much distended and after the condition has lasted some time, the body of the kidney becomes absorbed. The whole kidney becomes converted into a pouch-like mass of connective tissue, filled with liquid. This fluid at first is urine, but soon becomes converted into mucous secretion. In one case described by Siedamgrotsky, he observed, instead of a kidney, a large bladder or cyst, with walls formed of connective tissue, filled with a syrupy brownish fluid containing numerous cholesterin crystals. This condition is produced gradually, for any sudden interference or stoppage of the flow of urine would produce uræmia or rupture of the urethra and uræmia and death in a short time, but in hydronephrosis the condition comes on slowly and may result from periodic irritation and stricture of the urethra, from tumors of the prostate, the presence of calculi in the canals, or by inflammation of the mucous membrane of the bladder.

Clinical Symptoms and Therapeutics.—The cystic kidney in slight cases is rarely recognized; in more acute cases it is indicated by a fluctuating painless tumor in the region of the kidney; in certain cases there is a decided enlargement in the size of the abdomen; by puncture and use of an exploring trocar we find the urine like or serous-mucous like fluid described by Siedamgrotszky. When there is double hydronephrosis the urine is suppressed and symptoms of uræmia are shown very quickly. The disease can only be treated successfully when it is caused by obstruction of the urethra; (see later) for instance, where the obstruction is due to a calculus in the urethra and it is removed by surgical means. In case of unilateral hydronephrosis we may have to resort to extirpation of the diseased kidney (nephrectomy), however, successful results can only be expected if the other kidney is healthy or at least capable of functioning for both.

Nephritic Stones.

(Nephrolithiasis, Renal Calculi.)

Nephritic stones are almost always formed in the pelvis of the kidney and range from the size of a mustard-seed to that of a pea. (Megnin found two stones each weighing six and seven grammes in the pelvis of a dog.) Sometimes it is possible that renal calculi may reach the bladder through the ureter. They are irregular, warty, or sharply irregular, and consist of phosphate and carbonate of calcium; in rare instances the so-called cystic calculi are found; these, when first removed, are soft waxy bodies with a dull surface, composed of triple phosphate and uric acid.

The formation of these collections is not thoroughly understood, but they are probably formed by some foreign body, such as mucus, blood, fibrin, epithelium, urinary cylinders, shreds of tissue, or collections of bacteria; and whenever the urine is oversaturated with precipitable salts then the salts are deposited on this medium in successive layers, so that finally a large mass is formed.

Nephritic stones may produce pyelitis, pyelonephritis, or hemorrhage from the pelvis of the kidney. If the stone lies at the entrance of the ureter or even passes into that canal and becomes lodged, it will retard the flow of urine and even cause rupture of the ureter or pelvis of the kidney and death from peritonitis. Frequently the calculus is forced along the ureter, causing great agony, and finds its way into the bladder. Here they may become enlarged or when passing through the urethra become lodged in there. These stones are not, as a rule, diagnosed with any degree of certainty during life. Symptoms of pyelitis with the continual passage of small stones from the urethra are about the only indications that will guide the observer. Information concerning the therapy will be found under "Formation of Calculi in the Renal Organs."

Tumors of the Kidneys.

These neoformations can be determined only by a manual examination of the kidney through the abdominal wall. When they have produced a decided enlargement of the affected kidney, they frequently cause an enormous increase in the size of the kidney, particularly so in carcinoma, the soft form of cancer being most frequently seen. In the pelvis of the kidney and the ureters we seldom find irregular papilla-like formations (carcinoma papillomata, papilloma destruans (Kitt); these may obstruct the normal flow of urine and cause a distention and enlargement of the pelvis of the kidney and the renal ducts and an atrophy of the kidney itself. The only possible relief to such a condition is the surgical removal of the kidney.

Animal Parasites of the Kidney.

Of the various parasites of the kidney, which up to the present have rarely been found in dogs, the strongylus gigas (giant pallisade worm) has a special interest. This parasite is not unlike the common earth-worm, 10-70 cm. long and about the thickness of a lead pencil. It is generally blood-red in color, and generally found solitary. It is usually found in the pelvis of the kidney, causing great irritation of its mucous membrane, the pelvis of the kidney, which is purulent and shows hemorrhagic inflammation, and sometimes even the kidney itself being converted into an enormous cyst in the middle of which lies the parasite, twisted in a round spiral mass.

During life there are no symptoms which could be called characteristic and recognized with any ease. The animal may show evidences at times of periodic attacks of colic, of great pain, quick respirations, moving from one place to another, uttering occasionally short cries of pain, scratching or digging with the paws in an aimless way, great depression, staggering gait, inclination to bite, emaciation, the back is arched or bent laterally; in rare instances there are severe cramps of the posterior extremities. The urine is generally turbid and contains pus, blood, degenerated epithelium of the pelvis of the kidneys, and shreds of tissue; in rare cases under favorable circumstances we may find the eggs of the parasite, these are brown in color, oval in shape, and their external surface is granular or pitted; they are about 70μ long and 40μ wide. The presence of the eggs of the parasite is of course the only positive evidence of its presence. This disease no doubt generally results in death. The parasite may find its way into the bladder, producing a cystitis, or into the urethra, obstruct that canal, or it may be passed out entirely. As a rule the parasite causes so much irritation locally as to cause the death of the host. Lacosta, however, had a case where the animal passed the parasite and made a complete recovery. The treatment consists in the administration of oil of turpentine in repeated small doses.

Other parasites that occur in the kidneys are Cysticercus (pork measles) cellulosæ, Echinococcus polymorphus, Tænia serrata (in the pelvis of the kidneys), Coccidium renale canis, and some larvæ of nematodes that have not yet been definitely identified.

Uræmia (Urinary Poisoning).

If for any reason the kidneys no longer function properly, not only is there a disturbance in the voiding of the urine but there is a retention and accumulation of certain substances which under normal conditions would be discharged by the kidneys, or in disturbed functioning of the kidneys would form in the body and are classed with symptoms that give the impression of poisoning and are usualy called **uræmia**. Because of the nature of these substances it is generally conceded that the appearance of uræmia involves not only one, but several substances of which certain end products resulting from the disintegration of albumin seem to especially have a certain significance. Further information regarding this will be found in text books of physiology and general pathology. There are certain diseases during whose course uræmia may appear, as for instance severe nephritis, tumors of the kidneys, bilateral hydronephrosis, obstruction of the urethra by calculi, or severe strictures from scars, tumors of the prostate, "detrusor" paralysis and rupture of the bladder.

The disease may run its course in an acute or chronic form, which may become interchanged. **The acute form** is observed particularly during severe acute nephritis as well as in connection with complete retention of the urine and reveals itself by vomiting, trembling of the muscles, tottering unsteady gait, cramps, somnolence, decrease in temperature (sometimes there is an increase at first in the body warmth to 40° C. and occasionally even higher), later paralysis and coma. **The chronic form** may result from chronic nephritis or in incomplete retention of the urine and runs its course with less violent symptoms of which the following should be especially mentioned: depression, digestive disturbances, emaciation, difficulty in breathing, epileptifrom convulsions, and itching of the skin. The **treatment of** uræmia often corresponds to that of the primary disease. Sometimes, especially in obstruction of the urethra or neck of the bladder by renal calculi, an operation may be necessary. Ordinarily an attempt is made to throw off the harmful substances from the body by means of purgatives and diuretics. Repeated venesections and intravenous injections of physiological salt solution may be beneficial. Any further steps taken in a therapeutic way must be in accordance with the prevailing symptoms.

DISEASES OF THE BLADDER.

Catarrh of the Bladder; Inflammation of the Bladder.

(*Cystitis.*)

Etiology.—Catarrh of the bladder is generally caused by microbes such as coli bacilli and their kindred bacteria, and also by the pyogenic cocci, staphylococci, streptococci variety of proteus, etc., which find their way into it, as a result of certain infectious diseases from the kidneys or pelvis of the kidneys, by hematogenic means, or by certain chemical irritants, such as oil of turpentine, cantharides, carbolic acid, or creosote, and also calculi. Septic instruments, such as catheters, when introduced into the bladder, may set up an irritation of the mucous membrane. Cystitis is caused by the extension of an irritation from the urinary ducts. In septic or mycotic inflammations of the intestines, and thus the kidney carrying off waste materials, from irritation of the pelvis of the kidney, from the uterus, and from retention of the urine, caused by stones in the urethra in bitches. From hypertrophy of the prostate, or in case of well "house-broken" dogs that retain the urine, being unable to get outside, and as a consequence of retention produce a paralysis of the bladder, in bitches having a difficult or protracted delivery, from traumatisms, such as penetrating wounds, or contusions as a result of being run over by a wagon or automobile. When the urine becomes very alkaline from the excess of ammonia, it produces an irritating effect on the bladder, as also does continual retention of urine, especially when it is heavily charged with salts. It has been said that cold will produce cystitis. Cystitis may also be produced by the exten-

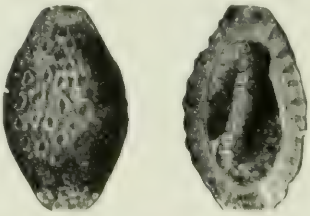


FIG. 107.—Eggs of Eustrongylus gigas (*Railliet*).

sion of inflammation from neighboring regions, or in grave infectious diseases an irritation can be caused by the toxins of broken-down micrococci being carried away.

Pathological Anatomy.—There are quite a number of varieties of cystitis—mucous, muscular, serous, croupal, ulcerous, diphtheritic, and gangrenous—but, as a rule, it is very seldom that we can differentiate between the various forms, and it is best from a practical standpoint to distinguish the disease as acute and chronic catarrh of the bladder. In the acute form the mucous membrane of the bladder is colored in an irregular way by dark red spots. It is also more or less swollen and at first covered with mucus and detached epithelium. In the later stages of the disease, the mucous membrane may be covered with pus and sometimes with small hemorrhagic spots. In very severe cases we find a croupous membrane covering the bladder, and it may be so acute as to cause gangrene, and mucous membrane is sloughed off and extensive abscesses are formed. In such cases the muscular and serous coats of the bladder are also greatly inflamed; and if the irritation is extensive enough, we may also find evidences of peritonitis, and submucous abscesses.

In the chronic form the mucous membrane becomes very much thickened and covered with enlarged mucous glands. The surface presents a peculiar greenish, reddish brown or slate-gray color. This is due to the hemorrhages that occur in the tissues from time to time. On the surface we often find raised papilla-like formations, and the submucous tissues and muscles are hypertrophied. Occasionally incrustations of uric salts may be observed on the mucous membrane.

Clinical Symptoms and Course.—The first symptom noticed in this disease is the passage of an increased amount of urine, the animal emptying the bladder frequently, but passing only a small quantity of urine each time, at the same time showing evidences of pain. In rare cases there may be a retention of urine due to cramp of the neck of the bladder from irritation. Sometimes erection of the penis occurs in the male dog. On making an examination of the bladder through the abdominal wall, the animal shows pain on pressure of that region. An examination of the urine by the microscope will assist us in making a positive diagnosis. If there should be some disease of the kidneys present, while the specific gravity of the urine is not much changed, in the early stages of the disease, it is somewhat darker than usual, more or less turbid, and there is an increase in salts and it contains only a normal amount of mucus, albumin, a few pus and perhaps a few red blood corpuscles, and masses of bacteria and epithelium of the bladder.

This condition may continue for a long time. The reaction of the urine depends on the nature of the bacteria present, and it is generally alkaline but may be acid at first, then neutral, as in cystitis produced by the coli bacilli. Mild cases of cystitis are not diagnosed, but as the disease continues the urine becomes thicker and turbid, and on making a microscopical examination of the urine we find numerous pus cells and epithelium of the bladder; the urine rapidly loses its acid reaction and soon becomes neutral or alkaline, and has a strong ammoniacal odor. Urine from an animal in this condition ferments very rapidly and contains numerous crystals of triple phosphate, ammoniacal phosphate of magnesia (shaped like coffin lid) and, in rare instances, uric acid crystals and numerous bacteria. (Fig. 103.)

Fever as a rule is present in this disease, but is never intense, but is of rather an intermittent character. There is also severe depression and loss of appetite. The course of the disease, generally, is rapid, and in slight cases the animal recovers in a few days; but in acute cases, the acute symptoms may last for weeks, and then the animal is liable to have relapses from time to time, and if the primary causes such as stone, urethral stricture, paralysis of the bladder, feeding with highly seasoned table refuse, providing cold damp bedding, continue, the cystitis becomes chronic. The chief danger in cystitis lies in the possibility of a complication of pyelitis, pyelonephritis, suppuration, paracystitis, etc., and death may finally be caused by perforation of the necrosed bladder and the animal dies of peritonitis, gangrene, or uræmia. The most frequent termination of the acute form is into the mild chronic form.

In the chronic form the symptoms are much milder, and for a long time the urine is the only guide to a diagnosis, as it is only in advanced cases that the animal will show any pain on pressure of the abdomen; the change in the urine characteristic in this condition is that it becomes strongly ammoniacal. The contractile power of the bladder is gradually lost, and the animal may present symptoms of incontinence of urine, passing small quantities of urine without any effort; or this is seen in well-trained house animals that pass small quantities of urine although making every effort to retain it until they are outside; or it may pass away drop by drop when they are moving about or asleep. In case of catarrh of the bladder of long duration palpation of the bladder often disclosed a distinct thickening of the walls.

Therapeutics.—The treatment of cystitis may be dietetic, medicinal, or local, according to the symptoms presented and what appears to be the cause. In slight cases it is only necessary to administer non-irritating diuretic agents, such as tartaric acid, dilute muriatic acid, liquor potassii acetatis, or infusions of juniper; and a lukewarm liquid diet, such as milk or soups This assists in increasing the amounts of urine and also in lessening its specific gravity, and by that means cleans out the bladder. In the more acute conditions, we try to correct the condition of the urine by means of internal disinfectants, such as salicylic acid, salol, boric acid, naphthalin, chloride of potassium, or urotropin several times daily in 0.5 doses, helmitol 1.0 three times daily, hetralin 2.0 three times daily, or a decoction of fol. uva ursi. The writer has always obtained good results from the administration of the last two agents.

In the treatment of this chronic form, in preference of the various alkaline salts, we should use the resinous diuretics, such as oil of turpentine, balsam of copaiba, or oil of sandalwood.

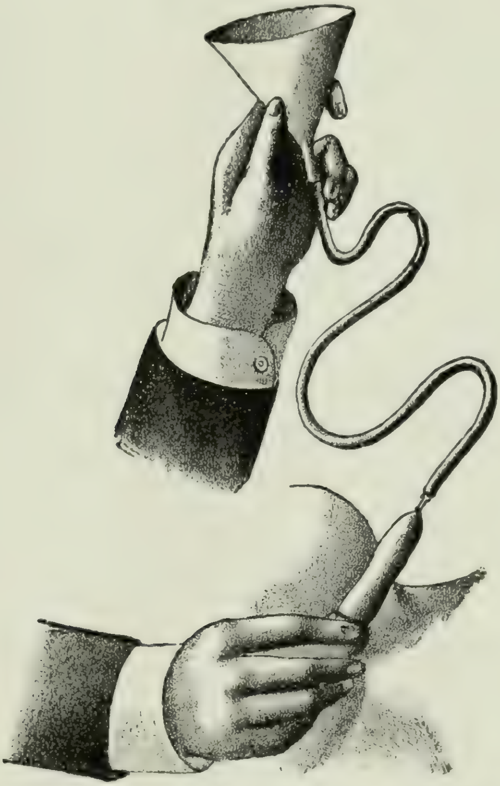


Fig. 108.—Apparatus and method of irrigating the bladder in the dog.

The local treatment of the bladder is very effectual, no doubt more so than the internal treatment. This local treatment is done when the urine is found to contain large quantities of bacteria and pus corpuscles, and when ammoniacal decomposition appears very quickly. This consists in introducing the medicinal agents directly into the bladder with regularly repeated injections and lavage by means of the elastic or metallic (for bitches) catheter. The catheter is introduced into the bladder and the bladder emptied, and by means of a small hose the catheter is connected with a small funnel (see Fig. 108), and a medicinal douche allowed to flow into the bladder, and then the hose is placed in a dependent position and the liquid allowed to trickle out. This can be repeated several times without removing the catheter. The bladder should be refilled and emptied until the injected fluid no longer shows noticeable discoloration. When the animal is very small and a very fine catheter is used, the fluid may not flow freely; in such a case a syringe is adjusted to the end of the catheter and the fluid forced into the bladder and again drawn out by means of the syringe, or an aspirator bottle may be used.

The writer first cleans out the bladder with clean, sterilized, lukewarm water, or lukewarm physiological salt solution, then washes with a lukewarm solution of boric acid, 2 per cent, or of tannin, 2 per cent; sulphate of zinc 1 per cent, solution of alum 1-2 per cent, resorcin 1 per cent, potassium of permanganate 0.1-1 per cent, nitrate of silver 0.1 per cent. Ginsiner recommends hydrargyrum oxycyanatum 0.5 per cent. Jahn had very good results with adrenalin (suprarenin in 1 to 10,000) in hemorrhagic cystitis. Pressnitz compresses or warm poultices to the hypogastric region, and morphine subcutaneously, or bromide of soda internally in cases where there is involuntary or constant urination, also warm clysters or mild laxatives to keep the intestines clear.

Where there is extensive hemorrhage, apply ice water compresses, absolute rest, irrigation of the bladder with 2 per cent solution of tannic acid. Creolin, 1 per cent, is also used, but is not as satisfactory as the former. The liquids must be tepid. In the dog, of course, this treatment is a little harder to perform than in the bitch, but with a little practice it is very easily accomplished and produces very satisfactory results. With the bitch a short metallic catheter can be used. Care should be exercised in avoiding the use of too highly concentrated solutions as the bladder is exceedingly sensitive and strong irritants often cause a severe increase in the inflammatory process. It must be remembered that house dogs must be allowed to go out frequently as the retention of urine is a frequent cause of this condition.

Debilitated or Paralytic Conditions of the Bladder.

Paralysis and Paresis. Vesical Uremia.

Etiology, Clinical Symptoms, and Prognosis.—Weak bladders, due to paralysis or paresis, are generally seen in old dogs, and are produced by a number of causes. One frequent cause of this condition is that house dogs that cannot get outside or are carried long distance on the trains, or are benched at a show, retain the urine for a long time, producing extreme distention of the bladder. Obstructions of various kinds which prevent the passage of the urine, such as the presence of a calculus at the neck of the bladder or in the urethra, as hypertrophy of the prostate, strictures of the urethra, by weakness of the muscular coat of the bladder, caused by chronic catarrh of that organ, and certain diseases of the nervous system also produce this condition. This condition may also appear as a protracted and generally incurable disease and is then primarily considered to be the result of diseases of the spinal cord, e. g. fracture of the vertebræ, extensive hemorrhage of the spine, myelitis, spinal meningitis, tumors; furthermore, it may occur in very old animals (senil paralysis of the bladder) in conjunction with severe cystitis and bladder tumors. In systemic diseases, extreme bodily weakness from certain poisons and brain diseases accompanied by unconsciousness, symptoms of bladder paralysis, may appear.

Clinical Symptoms.—There are two forms of this disease: Paralysis of the detrusor and paralysis of the sphincter vesicæ. It is quite common to find both conditions present in one animal. In the first condition (ischuria, retentio urinæ) the bladder becomes so distended that its elasticity is lost, and the muscular coat loses its power of contraction, and there may be complete retention of the urine for a while and, finally, when the bladder is so distended that the connective tissue alone holds it and presses on the sphincter vesicæ and overcomes it, the urine trickles out in small quantities (ischuria paradoxa, overflowing of urine). The animal is uneasy, makes frequent attempts to urinate and may or may not succeed in passing any urine; on palpation of the abdomen the bladder is found greatly distended, and mere manual pressure on the abdominal walls in the region of the distended bladder may cause evacuation of that organ; the urine passed is found to be highly concentrated and has a very unpleasant odor. The paralysis of the spincter vesicæ is termed overflowing of the bladder (urination by incontinence). When the sphincter is paralyzed the urine flows constantly or at very short intervals, the slightest contraction of the depressor being sufficient to expel it; this is painless to the animal. In this condition an examination by palpation of the abdominal walls shows that the bladder is nearly always empty. In making an examination of the bladder through the abdomen, when paralysis of the detrusor is present, the bladder will be found distended, even when the animal has passed some urine only a short time before, whereas in paralysis of the spincter the bladder will be found to be empty. As a rule there is no great change in the animal's condition, except in these cases where the original cause is some disorder of the spine; then the appetite is scanty and the animal shows great disinclination to exercise.

When cystitis accompanies this condition the animal shows more or less pain when it urinates. This, however, is seen only in rare instances. In the majority of cases the prognosis is unfavorable; the only cases in which a favorable termination is to be expected are those of simple distention of the bladder, as in house dogs, when from overdistention of the bladder when the animal cannot get out, or when a calculus is in the bladder or urethra and the cause is removed surgically.

Therapeutics.—The treatment best adapted to relieve this condition is to regulate the passage of urine, as in catarrh of the bladder, by pressing the bladder through the abdominal wall and emptying it, or catheterization and by injections into the bladder of claret wine, solutions of tannin 1 to 2 per cent, cold water, internally, tinc. nux vomicæ 5 to 10 drops once or twice daily, strychnia muriate 0.001 to 0.003 subcutaneously, or fluid ext. ergotæ 0.50, or cold water injections into the rectum. We can also try faradization of the bladder over the lumbar region, the abdominal wall and the perineum, and careful massage of the abdomen in the region of the bladder.

Stone in the Bladder.

(*Lithiasis.*)

Etiology and Pathological Anatomy.—The various lithic formations found to originate in the pelvis of the kidney and less often in the bladder are found either in the form of fine sand-like or gritty substances, or formed calculus; these may be subdivided into urates, oxalates, phosphates, and cystates.

Urates.—These consist of uric acid or uric acid salts, or both in combination. They are small, hard, yellowish or reddish-brown bodies, usually having a smooth surface; on cutting through the centre they are found to be formed in concentric layers or strata. Their presence can be detected by the murexid test.

Oxalates are composed chiefly of oxalic acid and lime salts, and are more or less mixed with uric and phosphoric acids. They are hard, brown in color, and have an irregular mulberry-like surface. Upon heating on platinum foil calcium oxolate changes to calcium carbonate and this foams when touched with hydrochloric acid.

Phosphates.—These are composed of phosphoric acid, lime, and triple phosphates. They are gray-white in color and, as a rule, are soft and friable. Test for phosphoric acid with molybdic acid.

Cystic Stones.—These are soft, wax-like bodies, having a shiny crystalline, irregular surface. They are yellowish to brownish yellow in color and are soluble in warm solution of ammonia; upon cooling the hexagonal microscopic crystals of cystin settle out.

All these lithic deposits contain besides their inorganic elements, numerous organic elements, such as epithelium, blood cells, mucous, etc.

Klimmer found on careful examination of 3,301 dogs that 12 or about 0.38 per cent were affected with stone. The size to which these calculi may grow is considerable. In Dresden there is a calculus taken from a German boar-hound that is 11 cm. long and 7.5 cm. wide, 6 cm. thick, which weighed 490 grammes when fresh. They are generally started in their formation in the pelvis of the kidney, and, generally, from some foreign body, such as a blood clot, a piece of mucus, epithelium, etc., around which, if the urine is surfeited with salts that can be precipitated (Klimmer), the sediment in the urine forms and gradually the crystalline elements accumulate. This deposit is formed very quickly in cases of cystitis, where the urine is undergoing alkaline fermentation and produces a copious sediment in the urine.

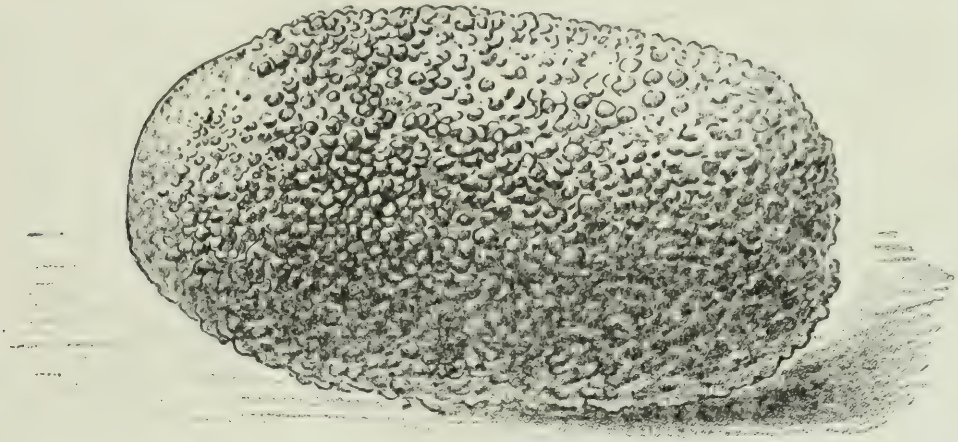


FIG. 109.—Stone in the bladder, reduced one-third.

Paul Bert and Studensky found by experiments that the food and fluids that the animal takes may have a certain influence on the formation of stone in the bladder. The former mentions two cases in which one was fed exclusively on meat and the other on vegetables and a foreign body was formed in the bladder of each. On post-mortem of the animal fed on meat there was found a phosphatic calculus, but no trace of inflammation of the urinary organs, while the dog fed only on vegetable diet showed a slight cystitis but no deposits of any kind on the foreign body.

Studensky placed foreign bodies in the bladder and found that when the animal was allowed to drink only water that was thoroughly impregnated with lime salts (1:1,000) that there was soon formed over the body a thick, yellowish-white heavy deposit of lime salts, and that results differed greatly in animals fed in the usual way, with pure water and meat. In the latter case the concretion was much smaller and deposited much more slowly.

Ebstein and Nikolaier were able to produce artificial urinary calculi within a few weeks by administering daily 4-6-.0 oxamid internally.

The irritation produced by stone in the pelvis of the kidney has been already pointed out. Stones in the bladder, as will be spoken of later, cause not only interference with the flow of urine, but by their weight and position may cause a compensatory hypertrophy of the walls of the bladder.

Clinical Symptoms and Course.—When the uric calculus lies in the bladder and has not attained any size, it may stay there a long time and not produce any marked symptoms, with the exception of a slight catarrh, and that is only noticed when the animal has had a long run, the urine then being voided with great difficulty, perhaps mixed with blood or mucus, and has a penetrating odor. Palpation through the abdominal wall, even when the bladder is partially filled, may discover the stone as a hard body lying in the bladder; in the bitch, the urethra being very short, it is easily detected by means of probing with a metal or stone sound, in the male dog this can only be done by means of an incision at the point where the urethra turns over the ischium; most bladder stones can be detected by the Röntgen rays. When the stone gets into the neck of the bladder or passes into the urethra and lodges at the posterior end of the bone of the penis very severe symptoms are noticed. Retention of urine is indicated by an entire suppression (ischuria), or urine is passed in a thin stream or only by a drop at a time, the animal showing great pain. A partial obstruction of urine is soon followed by a complete obstruction.

The symptoms presented in the dog are very striking. The animals are very restless, looking frequently towards the region of the kidney and whining. They place themselves in the position to urinate and strain violently without any result, or perhaps a few drops are passed and these may be mixed with blood. The appetite is lost and the pulse is rapid and thready; they stand with an arched back or walk with a staggering gait and extended legs. The abdomen becomes distended and we can finally feel the bladder through the abdominal walls like a hard, distended body which is very painful on examination. When the catheter is passed it goes in easily enough until the neck of the bladder is reached, when it stops and cannot be passed any further because of a hard subject, the stone, and no urine escapes from the catheter.

Uric calculi lie on the floor of the bladder and can be felt through the abdominal walls by manipulation, that is, of course, when they have reached a good size; the small ones escape detection, but they may be suspected when the urine has a gravel or sand-like sediment.

The urine, when it is retained in the bladder, gradually accumulates, and if it is not drawn off in three days the bladder is ruptured; it may even burst in two days. When this occurs it causes death in a few hours, with the following symptoms: The animal becomes dull or comatose, with shaking or trembling of the muscles, pulse, respirations and internal temperature decrease; straining and forced attempts to urinate cease, and the restlessness and pain seem to have disappeared. Pressing on the abdomen may produce great evidence of pain, but in the majority of cases this is absent, while percussion causes a rapidly increasing dullness in the lower parts of the abdomen, due to the free urine in the abdominal cavity. After the first two hours the abdominal wall is covered with a cold sweat, and the bladder cannot be felt on manipulation. Soon a deep coma from which the animal cannot be roused sets in and it dies in a short time. In rare instances the animal may have convulsions, which occur with short intervals between them. Death may also occur before the bladder is ruptured, as a consequence of extensive gangrenous cystitis with pyelitis.

Therapeutics.—While the first procedure in treatment of stone is essentially surgical, however in cases where the animal passes very small calculi or sand-like particles and shows every evidence of the presence of cystic calculi or where an animal passes small stones which lodge at the end of the penal bone and has to be operated on frequently, he should be given large quantities of liquids or waters that are supposed to have litholytic action—for instance, acids for dissolving phosphatic calculi, which form only from urine that is alkaline and almost always bacterially infected, giving a generous irrigation of the urinary passages, urinary antiseptics, weakened solutions of acids, but alkalies should be avoided. On the other hand it is well to use alkalines (sodium bicarbonate, one coffeespoonful daily) for breaking up uric calculi, or lithia mineral waters, such as Vichy, Kissingen, Carlsbad. Or the bladder may be washed out with various solutions (see cystitis). In oxalate and cystic stone the animal should be given all the water it will take. This of course applies only to such cases in which there is no trouble in passing urine; if retentio urinæ exists, then as little liquid as possible should be administered. When the stone is present and is causing retention of urine, there is nothing left then but to remove the stone by means of an operation called urethrotomy if the stone is lodged in the urethra at the posterior end of the bones of the penis, and this operation is necessary at once if, as a result of a calculus clogging the urethra, ischuria has set in and the catheter cannot be pushed without undue force past the stone or push it back into the bladder if the stone lies in the pelvic part of the urethra; or cystotomy if the stone is located in the bladder; this operation is performed by opening the urethra at the ischial arch, and by means of a small pair of forceps introduced into the bladder, through the urethra, the stone is grasped and crushed and afterward washed out of the bladder. In the bitch an incision is made into the short urethra and the stone is seized and crushed in a like manner.

When ischuria or stoppage of urine is present, the treatment depends to a large extent on the location of the calculus—that is, whether it is in the neck of the bladder or whether it has gone into the urethra some distance and lodged there. In the first instance we can sometimes introduce the catheter and by a gradual pressure we can push the stone into the bladder; or if it is further in the urethra, we can push a well-lubricated catheter past the stone and allow the escape of urine and prepare for the operation, for if the stone is in the urethra this must be performed immediately.

The author has succeeded in some instances after an injection of oil and with massage in removing the stone from the urethra either whole or in pieces after breaking it with a metal probe. However, the os penis usually acts as an insurmountable barrier in such attempts.

Urethrotomy.—This is usually performed from the posterior end of the bone of the penis, as the great majority of uric calculi pass down the urethra and lodge at the posterior end of the bone of the penis and can be detected by the catheter; when this is passed and comes against the stone there is a certain rough sound felt that resembles crepitation. Lay the animal on the side or back, and after having injected cocaine into the skin (or administered ether if the animal be very hard to handle, although this procedure is rarely necessary) insert a well-oiled catheter, make an incision about 3 cm. in length, cutting down on the median line on the skin making a free opening, then cut a second longitudinal incision on the urethra on the stone or on the end of the catheter (Fig. 210); the incision on the urethra should be much shorter than the incision on the skin, to avoid an infiltration of urine into the tissues after the operation; the calculus can then be pushed back toward the opening in the majority of cases, and by means of a pair of small forceps the stone is grasped and pulled out. In some cases it is necessary to enlarge the opening in the urethra; as a rule, however, do not make the opening any larger than is absolutely necessary. Occasionally when the stone lies in the canal just under the bone of the penis, it is extremely hard to remove, and after making the incision it has to be forcibly dislodged by means of the catheter.

Since more than one stone often occurs, it is necessary after the removal of the stone to make a thorough examination of the urethra with the sound or catheter to be sure that the passage is open. It is well to leave the wound open unless it is a very large animal or the stone should be exceptionally large; in that instance do not put more than one stitch in it. For two days the urine escapes out of the external opening, but soon closes up, and in about eight to ten days it has closed up completely and the urine is passed in the natural way.

The wound of the operation is apt to leave a stricture in the course of the urethra, and in an animal that is predisposed to the formation of calculi examine the urethra occasionally with the catheter and if a stricture is present dilate it with a bougie.

In cases where the stone is situated up in the urethra at the ischial arch it is much more difficult to operate on account of the well-developed bulbus cavernosum. The incision must be made down on the catheter, which has been previously inserted as far up as possible. The higher operation must never be attempted unless this latter precaution is taken, as it is almost impossible to find the urethra unless the sound is in it.

Another mode of operation is to introduce a catheter into the penis until it reaches the obstruction, and by means of a tape looped around the free end of the penis it is drawn away from the prepuce, which is held back by an assistant, and then cut down on the end of the catheter; the catheter is pulled back a short distance, but not entirely, and the penis bent over, and by means of a small pair of blunt forceps the stone can be removed; when this is accomplished pass the catheter into the bladder and wash out any calculi that may still remain in the bladder or urethra; by means of a small hose attach the catheter to a syringe and inject the bladder full of tepid water.

Technic and treatment are the same as for the urethrotomy described lower down. The author has as yet only found it necessary twice to operate at the ischial arch and in both cases met with satisfactory results.

In the bitch the operation is much more simple. The urethra is opened by means of a thin tenotome introduced on a grooved director and the opening enlarged, and then the forceps passed into the opening.

the stone crushed, and the bladder washed out. It is generally necessary to introduce one finger into the rectum to guide the stone into the forceps before it can be grasped. Great care must be taken in such an operation to avoid crushing the tissues. In the bitch there is no after-treatment necessary.

Cystotomy.—Laprocystotomy, or cutting through abdominal wall is the only mode permissible on the dog, lithotripsy being prohibited on account of the size and anatomy of the urethra of the dog.

Laprocystotomy, cystotomy suprapubica: Preparatory to the operation the urine is removed from the bladder and the bladder

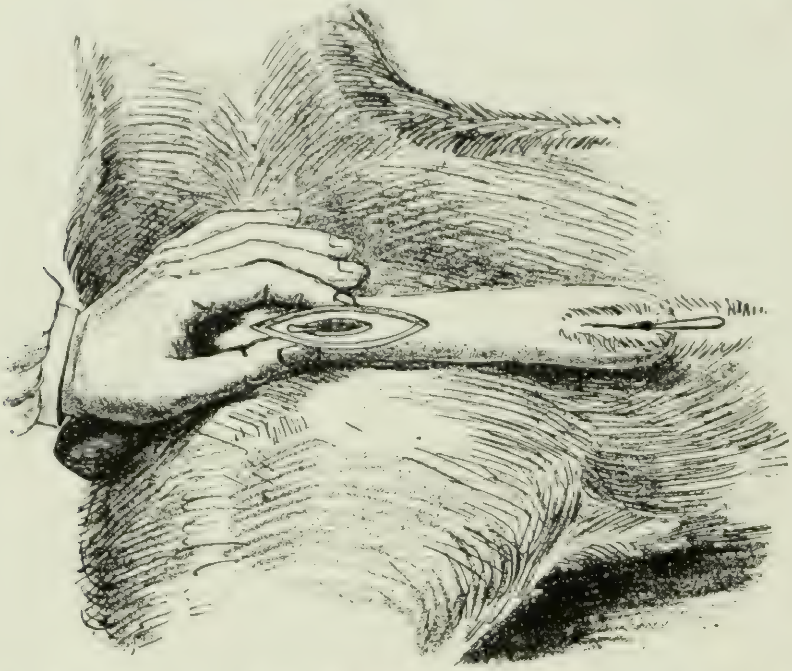


FIG. 110.—Urethrotomy. Catheter introduced and end seen at the incision.

washed out with a warm 2 per cent. solution of boracic acid, the tissues in the neighborhood of the incision thoroughly cleansed and disinfected, the animal is put under ether and placed on its back. After the necessary disinfection an incision is made through the abdominal wall in front of the pubis parallel with the prepuce and directly on the median line (in the bitch cut directly on the linea alba); make the incision about 6 to 12 cm. long, take up the hemorrhage by means of absorbent cotton, and incise through the peritoneum; then draw out the bladder, surround it with sterilized cotton compresses and an incision about 1 to 3 cm. is made in the bladder and by means of a pair of forceps the stone removed; if the stone is incysted it should be scraped out; the bladder is then washed out with boracic acid solution, the wound stitched with carbolized catgut, the muscular and serous coats are sewed with aseptic or antiseptic silk, with the edges turned inward, the stitches must be put very close together as distention with urine causes the very elastic bladder to open and allow the escape of urine into the peritoneal cavity; return the bladder after having first cleansed it with boracic acid solution, close the abdominal wall and cover the wound with a bandage. As blood clots are apt to form in the course of the urethra, French advises that the animal be catheterized at least twice daily until normal urination is established.

When the bladder is so distended that it is deemed dangerous to operate before emptying the bladder of its contents, we may empty the bladder by means of a fine trocar and canula. In the bitch the trocar should be introduced on the median line, at the brim of the pelvis, and in the dog, either on the right or left side of the penis, low down and as near as possible to the brim of the pelvis.

Sometimes ruptures of the bladder are caused by accidents, such as being run over by wagons when the bladder is full. The animal dies, as a rule, in forty-eight hours, from collapse, before peritonitis has developed. On post-mortem, the bladder is found to be infiltrated with blood and very much swollen at the lacerated region only. In injuries to the lumbar region, where the animal is dull or even comatose, it is always well to consider the prognosis doubtful, and Siedamgrotzky deems it advisable to consider the prognosis doubtful in injuries to that region, even where there are no acute symptoms presented.

Stricture of the Urethra.—Indications of painful retention of urine are often presented when there is a stricture of the urethra caused by injuries to the urethra from calculi or by cicatricial contraction following the operator's knife, from intense nephritis, or by torsion following coitus. An examination by means of the catheter generally gives some information as to the character of the stricture; the practitioner must, however, remember that there is always more or less normal stricture at the posterior end of the bone of the penis. The sound must be passed each day and allowed to remain about twenty minutes if the stricture will admit of it. The size of the catheters must be gradually increased; great care being taken to thoroughly disinfect the catheters after each insertion. This method has been used with success in a number of cases of stricture, but it must be continued for several weeks.

Hoffman cured a case of stricture of the posterior end of the bone of the penis by opening the urethra at the spot of stricture and amputating about 2 cm. of the bone of the penis with a pair of bone forceps.

Other Diseases of the Bladder

The following are comparatively rare and unimportant diseases of the bladder:

Cramp of the Bladder, Cystospasmus.—This is seen following severe cystitis, calculi, diseases of the prostate, etc. This condition is also observed transiently as a symptom from the effects of certain poisons, decayed food, from disease of the spine and from unknown causes. It is indicated by persistent cramp of the sphincter and retention of the urine (retentio urinæ) with painful tenesmus. The treatment consists in dry warmth, friction in the region of the bladder, luke-warm clysters to which chloral hydrate may be added, subcutaneous injection of morphia and the administration of boldine.

Neoformations of the Bladder.—The tumors of the bladder worth special mention are papilloma villosum and the carcinoma papillomatodes. The early most important symptoms are profuse hemorrhage which generally occurs suddenly and if it reoccurs from time to time, producing acute anæmia and often causing death. These tumors are generally associated with disturbances in the passing of urine and with a chronic cystitis. In the region of the bladder we are sometimes able to detect these neoformations in the form of a soft tumor-like mass and in rare instances we may find some portions of the broken-down tissue in the urine. In some instances instead of a solitary tumor we may find a diffuse cancer spreading over the wall of the bladder which on palpation feels like a hard irregular body. Other pathological growths may be sarcoma, carcinoma fibroma or myoma. It may be possible under very favorable circumstances, to remove these tumors by means of cystotomy, but it is very rarely done, for generally when we make the diagnosis the tumors have reached considerable size and involve the entire bladder.

Retroflection of the Bladder.—This condition may be found as a result of constipation or disease of the prostate, and from constant straining and tension, a distended bladder may be retroverted and lie between the urethra, the rectum and the prostate and may cause the development of a perineal hernia. If pressure is made on the soft fluctuating hernial tumor, the animals are apt to place themselves in a position to urinate. The treatment consists in attempting to remove the original cause by means of laxatives, warm baths, rectal enemas (see Diseases of the Prostate). If these methods do not succeed and the distention of the bladder becomes very pronounced, first try to empty the bladder by means of the catheter and if that cannot be accomplished, on account of the twist in the urethra, then empty the bladder by means of a trocar; the puncture is to be made in the upper part of the tumor. Generally when the bladder is emptied it falls back into position, or may be brought to it by massaging and pushing back from the region of the perineum and from the rectum, but the condition may return if the exciting causes return. To obtain a permanent fixture of the bladder, we must perform cystopexia (after Hendrix). This consists in making an incision into the abdominal wall on one side of the penis as near the median line as possible; insert the finger into the cavity and return the bladder to its normal position and suture it to the abdominal wall, so that the centre of the posterior wall of the bladder will lie on the anterior margin of the pubis. Other displacements of the bladder worth mentioning are: axial rotation of the bladder (Volvulus Vesicæ), which involves a twisting of the bladder on its axis preventing the urine from flowing out (sudden appearance, straining to urinate, retention of urine, increase in circumference of the abdomen, sensitiveness upon pressure of the distended bladder, inability to secure access to the bladder with the catheter) and prolapsus of the bladder caused by a vaginal tear at the time of parturition. Both of these displacements are rare occurrences.

Inflammation of the Urethra—Urethritis.—This is very rarely observed, being invariably caused by some traumatism, calculus or other foreign bodies, improper catheterization, injuries during coitus. Isolated cases have been observed of urethritis associated with infectious catarrh of the prepuce with swelling of the inguinal lymph glands (see later gonorrhœa of the prepuce). The symptoms consist in the constant flow of a muco-purulent fluid from the urethra, redness and tumefaction of the external orifice, the animal frequently places himself in a position to urinate and if he does succeed in urinating he shows great pain, and rapily licks the prepucial orifice. When exerting pressure on the urethra with the finger or sound (on the penis when protruding from the prepuce), a few drops of a muco-purulent discharge comes from the external opening. The treatment consists in the injections of astringents and antiseptic fluids, e. g. claret wine, sulphate of zinc, and 1 to 2 per cent solutions of zinc vitriol, solution 0.5-1% of nitrate of silver, 1-2% solution of protargol.

Strictures of the Urethra.—These are sometimes observed after injury to the urethra as from calculi, the operating knife (during urethrotomy) from careless probing, and sometimes, although seldom, in connection with acute urethritis. The symptoms are in general those of a more or less difficult voiding of urine; an examination with a sound or catheter gives more definite information. An attempt can be made to bring about a gradual dilation of the constriction by carefully inserting disinfected sounds or catheters of increasing sizes at intervals of 1-3 days into the stricture and allowing it to remain there from 5-20 minutes. This procedure has occasionally met with success after several weeks' treatment. In addition, urinary antiseptics and absorbents (potassium iodide, fibrolysin) are advised. Sometimes the stricture can be overcome by an operation.

DISEASES OF THE SEXUAL ORGANS

THE EXAMINATION OF THE SEXUAL ORGANS

In the male dog this examination includes the prepuce, penis, scrotum, testicles, including the spermatic cord and the prostates; in the bitch the vulva, vagina, uterus with ovaries and udder. Concerning abnormalities in the sexual function information is given elsewhere.

1. MALE SEXUAL ORGANS

1. PREPUCE AND PENIS.—A discharge of muco-purulent fluid from the external orifice as a rule denotes a prepucial catarrh (catarrh of the prepuce, gonorrhea of the prepuce). If the liquid is bloody, ichorous, or even foul smelling it indicates that the prepuce and especially the penis are affected with wounds, ulcers or neoformations (papilloma, carcinoma, sarcoma, which are often discovered from the outside because of their size and by a bulging in the region of the prepuce). A close examination of these parts should follow after the prepuce has been pushed back, and the penis exposed in the manner described previously. If it is impossible to expose the penis then a so-called Phimosis is usually present, which is a congenital or acquired abnormal narrowness of the external orifice of the prepuce which often becomes the indirect cause of so-called Paraphimosis. By this is meant that condition in which the penis, usually greatly swollen, has protruded from the prepuce, and has become constricted by it, so that it cannot again return into the prepuce. A true case of paralysis of the penis (prolapsus of the penis), in which the penis, without paraphimosis, hangs out of the prepuce limp and dry, and after being forced back generally prolapses again after a very short time, is generally observed as a result of spinal diseases, nervous distemper, senilismus, and after severe injuries, also as a result of congenital or acquired smallness of the prepucial sac. Tumors located near the tip of the penis may also cause a protrusion of the penis. Priapismus—i. e., a continued pathological erection of the penis without sexual excitement—may appear during spinal diseases (compression-myelitis, pachymeningitis ossificans, etc.), but is also seen occasionally in inflammatory processes of the urinary and sexual organs and in acute constipation. Round lymph follicles, varying in size from a grain of sand to a millet seed, can be felt and seen as a normal condition of the parietal and penal fold of the prepuce after it has been pushed back from the penis—especially at the base, where the skin turns back. It is only in rare cases, and then always with dogs under one year of age, that few or no lymph follicles are present (Seitz). In cases of long continual prepucial catarrh these follicles may cover the greater part of the glans and sometimes even develop into actual tumors. Of the tumors previously mentioned Sarcoma (lymphosarcoma) are of importance because they can be transmitted by coitus.

2. **SCROTUM AND TESTICLES.—An increase in the circumference** of the scrotum can be caused partly by pathological conditions of scrotal skin (œdema cutis, eczema, varicose formations, tumors, etc.), partly by such conditions within the scrotum, on the testicles and their coverings, or on the spermatic cord. Aside from certain diseased conditions which seldom can be determined clinically, the only pathological conditions of the interior of the scrotum, the testicles and sper-

matic cord, that are of interest are rupture of the scrotum, orchitis, and the tumors of the testicles which formerly were classed under "sarcocela." **Rupture** of the scrotum, which usually appears only on one side, is characterized by a variation in size, absence of pain, and reducibility at least toward the region of the back, when manipulation of the scrotum usually discloses the testicle greatly reduced in size as a result of prolonged hernia. **Orchitis** can be recognized, by swelling and great sensitiveness upon pressure of the testicle, by an increase in temperature of the scrotum and by a tense gait of the patient with legs spread apart. **Tumors** of the testicles (carcinoma, sarcoma, fibroma, testicular tubercusosis, etc.) appear in the form of firm, hard formations, painless or almost painless upon pressure often with uneven, granular knotty surfaces. A conspicuous **smallness of the scrotum** may be caused by atrophy of the testicles or by being cryptorchid. In the latter case the very small testicle can sometimes be felt in the inguinal canal. In unilateral cryptorchidism the other testicle in the scrotum is generally extra well developed. A marked **pendulous** condition of the scrotum with varicose changes of the skin is sometimes seen in older animals.

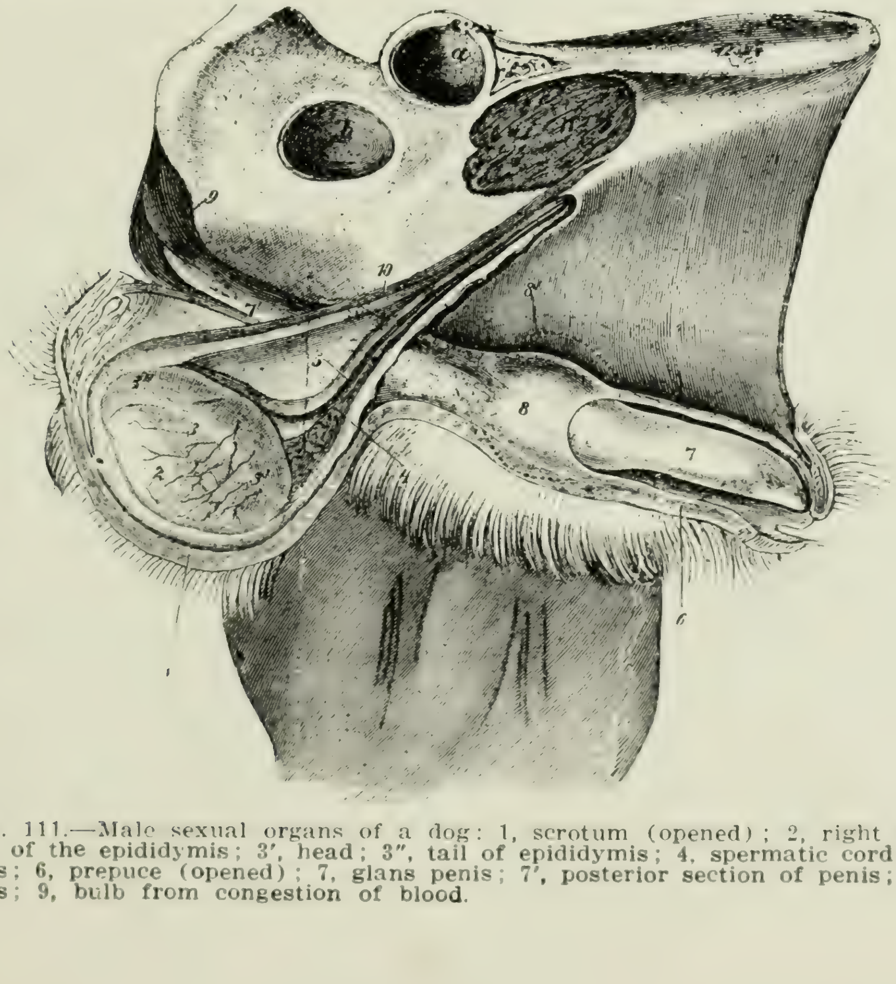


FIG. 111.—Male sexual organs of a dog: 1, scrotum (opened); 2, right testicle; 3, body of the epididymis; 3', head; 3", tail of epididymis; 4, spermatic cord; 5, vas deferens; 6, prepuce (opened); 7, glans penis; 7', posterior section of penis; 8, bulb of penis; 9, bulb from congestion of blood.

3. **PROSTATES.**—The size of this protruding gland depends upon the size of the dog and varies in size from the size of a hazelnut to that of a walnut. It surrounds the neck of the bladder and the beginning of the urethra in the shape of a two-lobed, firm, round formation, and is located on the os pubis or on the anterior margin of it. If of a normal size it can easily be felt by introducing the index finger into the rectum; if enlarged it is necessary to resort to palpation from the abdominal wall towards the pelvis. In this manner one can determine **hypertrophy of the prostates** (a tumefaction in the form of the normal gland, non-sensitive to pressure, sometimes hard and sometimes soft, usually smooth on the surface or slightly uneven and sometimes larger than a fist); **acute prostatitis** (swelling, sensitive to pressure, soft, more or less extended fluctuating, prostatic abscess); **chronic prostatitis** (condition in general the same as in hypertrophy of the prostate, but occasionally partial or extended fluctuation from the formation of cysts) and **tumors of the prostates** (irregular, often knotty glands that enlarge painlessly to a certain stage). Tuberculosis of the prostates also generally causes an uneven, knotty enlargement of the glands. In case of an abscess of the prostates a purulent secretion may flow from the urethra or prepuce upon severe pressure on the gland.

II. FEMALE SEXUAL ORGANS

1. **VULVA AND VAGINA.** The examination of the vulva and vagina is made partly by direct palpation with the index finger, partly by inspection, which necessitates the insertion of a vaginal speculum if the vagina itself or the parts of the vestibulum vaginæ that are located locally are to be examined. Preference is given to the use of the two-pronged speculum, shown in Fig. 96, because it enables one to gain an unobstructed view of the mucous membrane, made accessible by the speculum, but it has the disadvantage that the examination can scarcely extend beyond the vestibulum vaginæ because of the folds of the vaginal mucous membrane. The tubular specula, on the other hand, have the advantage, if they are long enough, of allowing one to observe through them the local parts of the vagina as far as the portio vaginalis uteri. This is of course only possible in very large bitches. Even for medium-sized animals, the tubular specula are generally too wide, and for small dogs only the smallest, two-pronged vaginal speculum, resembling in size and shape the tong-shaped ear speculum (see later) can be used. In such animals it is even impossible to insert the

index fingers into the vaginal vestibule; nevertheless the vagina of the bitches can be examined through finger palpation by way of the rectum (Fig. 95). Under certain conditions the local parts of the vagina can also be palpated from the abdomen in the region of the pelvis.

With the exception of true local epidermal changes and of surgical cases on and in the vulva, which cannot be discussed in detail here, the **discharges from the vulva** are of diagnostic importance. During oestrum (heat), which under normal conditions occurs twice each year, generally developing from June to July and from December to January, a bloody mucous discharge, the so-called "Color," flows rather copiously from the severely swollen vulva. During the stage preparatory to birth the discharge is thick, tough and glossy. The lochia characterize themselves by the discharge of a fluid whose odor is not offensive and which is at first of a bloody serous nature, later mucous-like and finally thick and yellowish-white, and which, like all other discharges from the genital organs, is licked off with avidity by the animal. A glossy mucous-like, muco-purulent, creamy, bloody, discolored or ichorous discharge is present in the various kinds of inflammatory or ulcerous processes of the vagina or uterus as well as in ulcerous neoformations of these organs. In order to determine the exciting cause (primary disease) this discharge necessitates a careful examination of the vagina by palpation and inspection (see above), but also if this examination proves useless the insertion of a catheter into the uterus. To avoid mistakes the vagina should first be flushed out thoroughly. An error may result in that the fluid in the uterus is so thick that it cannot pass through the catheter. By means of the injection or infusion of warm water (boric acid water) this trouble can usually be overcome. It is also important to note that mucous-like, purulent or bloody discharges originate from the urinary passages and may remain in the vestibulum gavinæ after the animal has urinated. Definite information can be obtained by observing the act of urination or by catheterization. In general the discharge in simple **catarrh** of the vagina or uterus is sero-mucous, sometimes slightly discolored. In **purulent vaginitis** and **endometritis** muco-purulent, in **chronic catarrh** of the vagina or uterus, thick dirty-white and glossy. Another characteristic of chronic catarrh of the uterus (fluor albus) is the frequent intermittent appearance of a discharge while the animal is lying down, during passage of urine or fæces, or even when lying on its back, or it may occur at longer intervals. In **septic metritis** a putrid, bloody ichorous, chocolate colored fluid flows from the swollen vulva, which, like the vaginal mucous membrane is of a blue red or livid color. In general the visible changes of the vaginal mucous membrane correspond to the above-named diseases. Of the various **tumors** found in the vulva and vagina the fibroma, lipoma, papilloma, carcinoma and sarcoma are of practical importance. The first two forms are often pediculated and may be located between the labia pudendi or hang out and resemble a prolapsus vaginæ. Papilloma are generally located in the form of wart-like or shaggy formations resembling cauliflower growths in the vestibulum vaginæ; likewise carcinoma and sarcoma (lymphs-sarcoma), which apparently can be transmitted by coitus. When inspecting the vestibulum vaginæ it is well to remember that the clitoris of the bitch is quite large—e. g., in medium size bitches it may attain a length of 4 cm.—and that the mucous membrane of the fossa clitoridis may be covered with small papillæ, which need not be considered as pathologic at all.

2. **UTERUS AND OVARIES.**—With regard to its structure the uterus is located midway between a uterus bicornis and a uterus bipartitus for the uterus body (4 to 8 cm. in length) has located within it a partition (0.5-1.5 cm. in length) extending from the fundus uteri. It is located almost entirely in the abdominal cavity. Long, almost straight horns project upwards from the uterus as far as the height of the 6th and 7th vertebra, forming a Roman letter "V" and extending into the region of the kidneys. From this description we can conclude that an examination of the uterus can only be made by palpation through the abdominal wall; however, a decided distention (pregnancy or fluid) is necessary for this. The normal empty uterus cannot be felt by palpation from the abdominal wall; but it is possible to insert a button sound of a suitable length into the uterus through vagina and to feel the tip of the sound from the abdominal wall. One is then more likely than otherwise to determine with the hand holding the sound, moderate fillings of the uterus or severe thickening of its walls (in chronic catarrh of the uterus) and perhaps also uterine tumors.

Large accumulations of fluid in the uterus **(hydrometra, pyometra)** show a corresponding increase in the circumference of the abdomen with resultant areas of dullness and can be distinguished from the fluid accumulation of **abdominal dropsy** in that the former cannot be displaced, and by the irregular horizontal limitation of the dull sound in abdominal dropsy which extends towards the region of the kidneys, by palpation which shows a taut, sometimes fluctuating, sack-like mass and by the result of the exploratory puncture. **Inguinal hernia** which anatomically closely corresponds to the uterus, is located in the posterior mammary region and often cannot be completely reduced. If the uterus is located in it the vagina is increased in length, narrowed and drawn toward the diseased side.

The ovaries lie completely enclosed by the ovarian sac surrounded by a fatty layer, close to the kidneys about midway between the last rib and the hip and cannot be palpated. But this may be possible in case of very large ovarian tumors (sarcoma, adenoma, cysts, etc.), which can then also be determined by percussion.

3. **UDDER.** The udder of the bitch extends along the abdomen from the vaginal region to the sternum, and consists on each side of 4-5 glandular divisions which may be quite definitely marked, but are often connected by parenchyma-bridges. Each division has a teat. According to their position these teats are classified as chest, abdominal and genital teats. Aside from the various skin eruptions the **increases** in circumference of the udder are of practical interest. Such increases can be seen in the various forms of **mastitis,** which in most cases affect only individual glandular parts; in lacteal congestion after loss of the young; during the swelling when the udder begins to lactate, which often occurs in non-pregnant bitches 6-8 weeks after the period of heat has ended; and especially in tumors of the udder which are a frequent occurrence in old bitches. Of the many tumorous formations that may be located in the udder the **mammary cancer** should be mentioned particularly. It is characterized by its uneven tubercle formation and the affection of the regional lymph glands.

DISEASES OF THE MALE SEXUAL ORGANS

DISEASES OF THE PROSTATE

Inflammation of the Prostate

(*Prostatitis.*)

A number of causes lead to inflammatory processes in the prostate which produce hypertrophy or neoformations of that organ; the enlargement may be temporary or permanent, but as a rule it invariably produces more or less interference with the evacuation of the fæces, and obstruction of the free passage of urine.

Inflammation of the Prostate.—This may result as a complication of cystitis, urethritis, urinary calculi, from careless or ignorant catheterization and from the pressure of hard masses of fæces lying in the rectum in persistent constipation, prostatitis, etc. Prostatitis is also observed in stud dogs that have served a large number of bitches within a comparatively short space of time or have been in the stud for a number of years, and it also results from pyæmia.

Symptoms and Course.—The disease may occur in the acute or chronic form; the latter is discussed under hypertrophy of the prostate.

The acute form is rare and causes the animal to walk with back arched and a stiff, stilted gait, and show evidence of great pain when either urine or faeces are passed. In cases where there is great enlargement of the prostate the animal may hold the faeces and cause constipation by not putting any pressure on the abdominal muscles or may also retain the urine. On making an examination of the gland, by introducing the finger, well lubricated, into the rectum, we find it very much enlarged, hot and painful to the touch, and the animal shows great depression, loss of appetite and fever. The animal exhibits great pain during catheterization when the instrument passes the prostate.

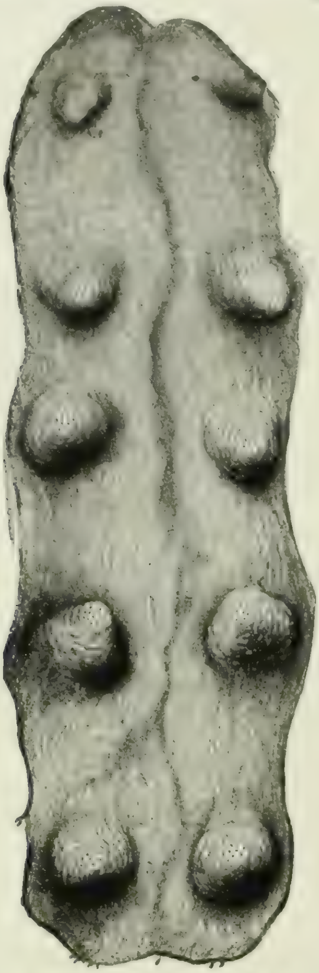


FIG. 112.—Breast of bitch that was pregnant several times (with ten teats) (*Ellenberger and Baum*).

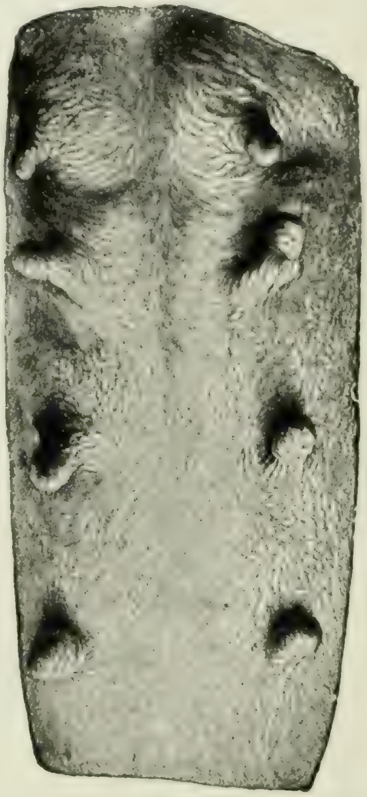


FIG. 113.—Breast of bitch that has never been pregnant (with eight teats).

The terminations of this acute condition are as follows:

The prostate may break down and suppurate, forming a fluctuating tumor in the pelvic cavity; accompanied by great difficulty in urination and evacuation of faeces, or it may assume the chronic form and develop cysts; this latter condition, however, is rarely diagnosed during life. Sometimes these cysts are seen on post-mortem, and the animal previous to that was without any fever or acute symptoms, or the inflamed prostate may ultimately form abscesses which break through into the urethra (the pus flows off above or with the urine), or the rectum, and in very rare cases into the connective tissue of the pelvis. In the latter termination we find a gradual tumefaction and formation of an abscess in the perineal region, which suppurates and breaks through the perineum, or there may be the formation of small abscesses which become encapsulated in the prostate.

Upon palpation the fluctuating sections of the prostate are found to be more bladder-like, but not increasingly warm or sensitive. Sometimes the prostate after developing into the suppuration form or also in the cystoid form may change into one large sac which may almost fill the entire abdominal cavity, and which may resemble a very full urinary bladder or ascites and may cause the perineum to bulge in a hernia-like manner.

Therapeutics.—This consists in giving the animal small quantities of non-irritating food, cold or lukewarm, mucous-like, oily clysters or injections, and cold or lukewarm applications to the perineum; also the frequent passage of the catheter to prevent overretention of urine in the bladder, but if the retention is already very marked the catheterization should be done at suitable intervals; and also the administration of saline purgatives, such as sulphate of magnesium, Carlsbad salt, etc.

In the meantime suppositories made of cocoa butter and extract of belladonna or opium may be beneficial. When pus has formed, which can be determined by digital examination per rectum, introduce a speculum into the rectum and cut down on the fluctuation by means of a sharp-pointed bistoury. The hemorrhage which follows is very slight, and no attention should be paid to it. Hendrix introduces the finger into the rectum and puts considerable pressure on the fluctuating prostate and breaks the abscess into the urethra. Where the swelling extends to the perineum and distends it, it is best to apply warm applications until the pus has formed, and then cut down and evacuate the sac.

Chronic Prostatitis (Hypertrophy) of the Prostate.—This is the form of the disease most frequently seen, and develops from the acute form, but in the majority of cases the disease starts in at the onset, as the chronic form. It is a common disease in old dogs, and is indicated by a hypertrophy of the whole organ; as a rule, the swelling is symmetrical, but sometimes one side of the gland is larger than the other. The surface is smooth or rarely very slightly uneven. It varies in consistency; in some cases very hard, in others, soft; in the former case it is due to a hyperplasia of the fibro-muscular tissue; in the latter it is due to an infiltration of the gland with a purulent fluid as a consequence of chronic purulent inflammation.

The symptoms of a hypertrophy of the prostate are irregular. The one most frequently observed is disturbances in defæcation which under certain conditions may develop into complete retention of the fæces. The desire and toward straining to evacuate may occasionally cause a tendency toward retroflexion of the bladder or produce a perineal hernia as well as a rectal diverticulum; in some cases there is difficulty in urination (dysuria, strangury), and also more or less cystitis and pyelitis, etc., or constipation due to the animal making no effort to evacuate fæces. The surest means of diagnosis is to make a digital examination of the prostate per rectum, and in case of marked enlargement of the prostate also from the abdominal wall, it is distinguished from the acute form by the absence of heat and sensitiveness, but is very much larger than the normal gland, and may be hard or softer. Rossi contends that hypertrophy of the prostate does not affect the urinary canal to any great extent; the tissues of the prostate only are affected and situated as it is on the floor of the pelvis, it has plenty of room to expand. Lienaux observed one case where there were intermittent hemorrhages, and finally interference in urination and evacuation.

Therapeutics are not productive of much good results since hypertrophy of the prostate is considered incurable. For the constipation give saline laxatives; if the urine is retained, catheterize the bladder and administer internally ergot or iodide of potassium. The remedy that has given the best results has been the hypodermic injection into the gland of a solution of iodine (iodide of potassium, 2 parts; tincture of iodine, 2 parts, and water, 60 parts) at intervals of fourteen days. The solution is injected through the rectum directly into the gland by means of a small hypodermic syringe.

Castration has been repeatedly tried; in a number of cases it has produced very good results and the animal was greatly relieved from active symptoms, the prostate being reduced to its normal size, but in certain cases the animal steadily failed, lost flesh, and in three or four weeks became a skeleton and died apparently from inanition.

Tumor of the Prostate.—Tumor of the prostate is generally carcinomatous in character, causing an irregular enlargement of the gland, differing from the symmetrical enlargement seen in hypertrophy of the gland; this aids materially in reaching a diagnosis. Up to a certain stage in the development the enlargement is painless. It is rather difficult at times to make a diagnosis where only the general indications of hypertrophy of the prostate are seen—that is, difficulty in defecation and urination, and conclusions can only be based on the general health of the animal, which shows a gradual want of nutrition. Lienaux recommends extirpation of the prostate (prostotomy) even in simple hypertrophy. Other anomalies, such as prostatic calculi, tuberculosis of the prostate, have no particular interest and need not be taken up here.

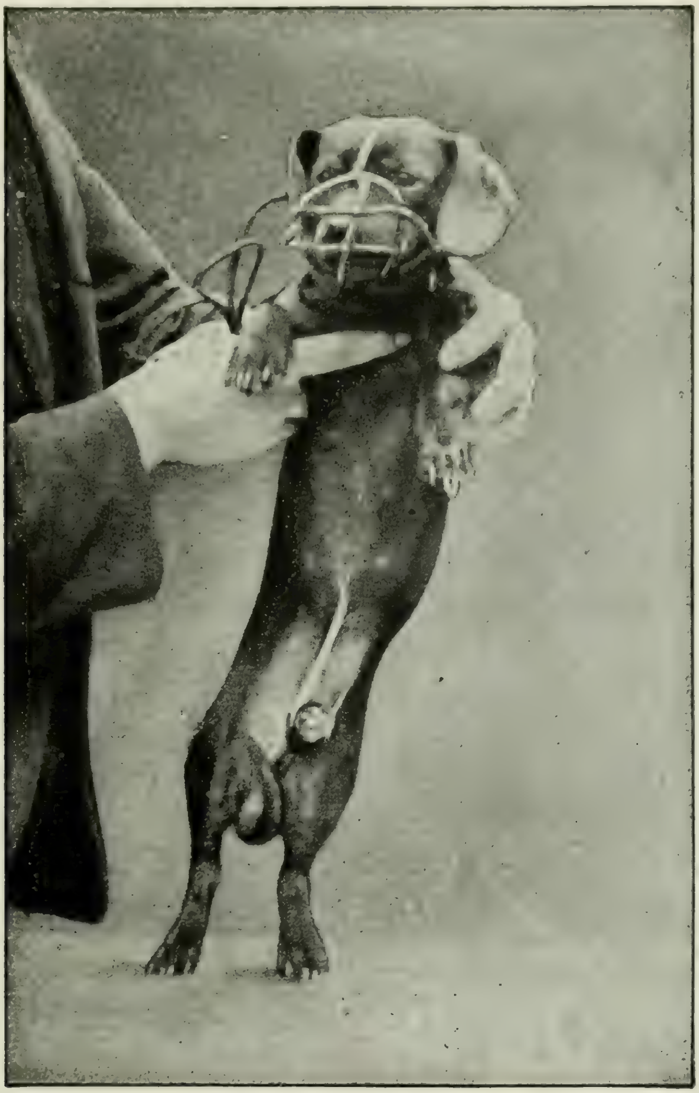


FIG. 114.—Case of paraphimosis.

DISEASES OF THE PENIS AND PREPUCE

Phimosis and Paraphimosis.—By **phimosis** we mean a contraction of the prepuce over the free end of the penis. It is often of congenital origin, but is occasionally caused by injuries and consequent cicatricial contraction; but as in the dog, the foreskin is rarely withdrawn, it is of little importance; if, however, the contraction is so complete as to cause retention of a certain amount of urine the retained urine decomposes and acts as an irritant, causing inflammation and tumefaction of the prepuce. Phimosis may prevent copulation, and as soon as the penis is erected, causes paraphimosis, or after coitus paraphimosis may result. Treatment consists in making a longitudinal incision on the median line of the prepuce and removing a certain amount of the tissue and sewing back the mucous membrane. Sewing back the mucous membrane to the skin or cauterization of the edges of the wound are of importance because simply an incision or the circumcision recommended in severe phimosis, often afford only temporary relief. **Paraphimosis** is the condition where the penis passes through the narrow opening of the prepuce the glans become swollen, and the prepuce becomes tightened behind the glans penis, the narrow ring of the prepuce causes venous engorgement, becomes œdematous, extremely painful, causing a great swelling and purple coloration of the glans, and if this is allowed to remain some time, causes partial gangrene. The above phenomenon is seen during coitus or from erection in attempting copulation, from traumatic causes, from neoformation, or paralysis of the penis.

The therapeutics of paraphimosis consists in reducing the glans as soon as possible with friction and careful manipulation; this is accomplished by careful lubrication of the parts with some bland oil and putting a steady pressure on the glans, at the same time pressing forward the prepuce over the enlarged part; with a little patience it is reduced. If this is not successful, bathe the glans with cold water or alum applications, lead water, sulphate of zinc, or wrap the protruding portion of the penis in a cold bandage, beginning at the outer end and quickly wrapping it around the distended penis, thus forcing the blood out of the engorged glans, then as the bandage is removed the penis is returned, drawing the prepuce over it. If we do not reduce it by this means, then cut the ring with a curved probe-pointed bistoury or a pair of scissors. It can then be returned immediately and the edges of the wound joined by a few stitches. Scarification of the penis is rarely necessary and should be avoided wherever possible. In extensive necrosis of the glans, paralysis, tumors, etc., it may be necessary to remove the penis; this is removed by a circular sweep of the knife. If the penal bone is to be cut through it may be done by means of a pair of bone forceps or sawed through, otherwise the amputation can be made just back of the os penis. This operation is also advised under certain conditions in case of injuries, tumors and paralysis of the penis.

To overcome stenosis of the urethra from cicatricial contraction of the wound the urethra is opened about 0.5 cm. and sewed back of the wall of the penis. It is well, however, not to resort to this until you have tried every other method. Since dogs subjected to this operation generally are not castrated it is necessary to remove the testicles to eliminate the sexual desire which can no longer be satisfied.

Gonorrhœa of the Prepuce. Preputial Catarrh.—By this term we mean catarrhal or purulent inflammation of the mucous membrane of the prepuce; it is rather common in dogs that are well fed; it is harmless but unsightly from the discharge of yellow mucus constantly dripping from the end of the prepuce, and some cases are extremely obstinate to treat. It may be caused by retention of urine, through irritating qualities (catarrh of the bladder), phimosis, calculi of the bladder, prolonged coitus, dirt, uncleanliness, or masturbation, and it sometimes appears as a result of distemper. It is frequently observed in old dogs, due in their case to stagnation of the veins of the prostate. The symptoms consist in slight redness, and swelling of the prepuce and glans, and the secretion of a thin, purulent mucus, which is generally licked off by the animal. On pushing back the prepuce, the lymph-follicles are generally found to be swollen, and can be felt on manipulation with the finger as small bodies about size of a seed or pea. In rare cases the inner wall of the prepuce and the bulbous portion of the glans are covered with papillary excrescences Ulcerous processes and swelling of the regional lymph glands occur but rarely, sensitiveness to external pressure, difficulty in voiding urine and general disturbances of health occur only in isolated instances and then only in very severe cases; however an eczematous dermatitis often develops in the region of the prepucial orifice. Rarely or ever in this condition is there any pain on pressure of the affected parts. The treatment consists in the injection of acetate of lead water or 1 per cent solution of zinci sulphas or argenti nitras, 1 per cent, or claret wine. Before making the medicinal injection it is well to thoroughly clean out the prepuce, with repeated sluicings of luke-warm water.

The disease has no correlation with the specific gonorrhœa of man, but in rare cases we may find an animal affected with gonorrhœa which has extended from the foreskin into the urethra and an enlargement of the inguinal lymphatics, forming a bubo. In one of the cases observed by Siedamgrotzky, the gonorrhœa was accompanied by intense inflammation of the eyes.

Neoformations of the Glans and Prepuce.—Neoformations are sometimes found on the dog and are either papilloma, carcinoma, or sarcoma.

These appear in a variety of forms—warty or corrugated, sometimes pedunculated but generally with broad bases, hard or soft and bleeding easily to the touch, situated on the penis or prepuce, visible only when the prepuce is retracted except in rare cases when they are situated on the external opening of the prepuce and protrude beyond the opening. There may be a more or less abundant discharge of purulent mucus, stained occasionally with blood. Sometimes a continued bleeding takes place from the prepucial orifice. Transmission of sarcoma to bitches through coitus has been observed frequently. (For infectious genital tumors, see under that head.) The papilloma can, as a rule, be removed after the prepuce has been retracted, by the scissors, knife, or a small pair of forceps, and blood stopped by compression or a solution of alum, or, what is much better, the thermo-cautery, the caustic stick or with a solution of iron chloride. Albrecht recommends that the tumor be touched daily with a solution of chromic acid 1 to 30. Carcinoma and sarcoma generally require the removal of a portion of the glans. (See chapter on Neoformations.)

DISEASES OF THE TESTICLE AND ITS COVERINGS

Inflammation of the Scrotum.—We frequently see inflammatory conditions of the scrotal covering as a result of contusions; they may, however, be caused by eczema, which sometimes causes great swelling and sensitiveness, the animal walking with a peculiar straddling gait; this condition may involve the entire scrotal sac, and on account of the irritation of the tissues from the animal constantly licking and biting affected part, it is very slow in healing, and frequently covers a long period of time before making a complete recovery. Occasionally partial necrosis occurs, followed by sloughing of a portion of the scrotum. (See Diseases of the Skin, under Eczema.) Moller has also seen serpentine varicosis of the scrotum with ulceration and accompanied with profuse hemorrhage. Treatment: Keep the animal in a dry, clean kennel, or let it lie on a cushion and prevent the rubbing on any rough object and apply oxide of zinc, talcum powder, bismuth preparations, salicyl dusting powder, dermatol, xeroform, or boracic acid, and the animal must be restrained from licking or irritating the affected portions, either by means of a muzzle or the scrotum covered by a Priessnitz bandage. If necrosis develops as a result of the condition just described or from traumatisms or freezing, etc., and the sloughed portion is very extensive it may be necessary to castrate the animal as well as remove the necrosed portion. Further treatment will be discussed later under "Eczema."

Inflammation of the Testicle—Orchitis.—Orchitis is observed quite frequently in dogs, but without any other injury is very rarely seen in the dog; it may be caused by a kick, or a blow, or from crushing or by metastasis, or from acute inflammatory conditions of the adjacent urinary organs. The inflamed testicle is hot, swollen and smooth on its surface and very sensitive to the touch; the animal walks with its hind legs wide apart, and sometimes there is fever and loss of appetite and occasionally vomiting. In the majority of cases, the irritation subsides quickly, and the animal is well in a few days; in rare instances, the irritation is followed by suppuration and the formation of more or less pus, the abscess points, breaks through the scrotum and discharges. In acute cases the inflammation develops into the chronic form and on the subsidence of the acute symptoms it is followed by induration of the testicle and that body becomes firm and irregular on its surface. In one case that the writer observed the epididymis was also greatly swollen (epididymitis). The therapeutics consists of warm applications and rest, paint with tincture of iodine and apply a well-padded suspensory bandage over the scrotum whenever possible. When the effects of the iodine have passed off apply salicylic acid ointment, camphor salve or weak mercurial ointment. If suppuration, but especially if putrid pus formation, has commenced, it should be encouraged as much as possible with warm applications and poultices and opened

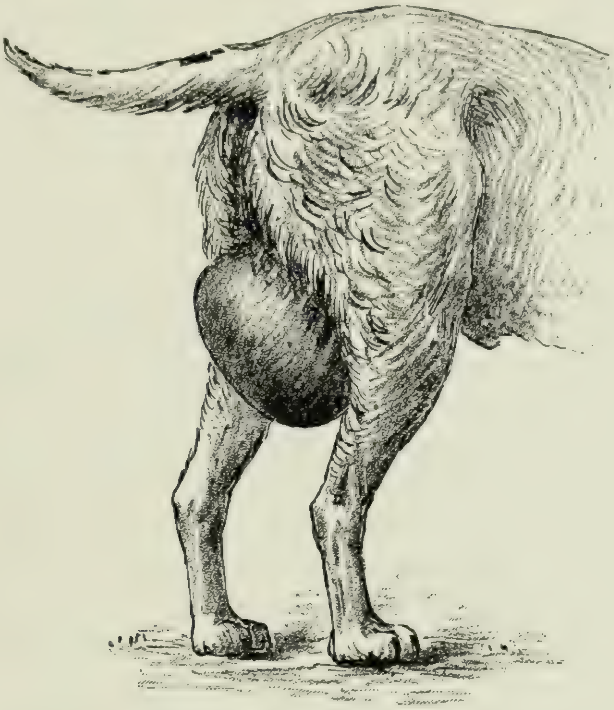


FIG. 115.—Enlargement of scrotum.—Orchitis.

as soon as the abscess has pointed, cleaned out with corrosive sublimate solution, and treated as an open wound, but often castration is more advisable than such treatment. There is no treatment that will have any permanent effect in chronic orchitis.

Injuries to the Testicles and Scrotum

As a rule, the wounds of these parts are caused by fighting with other dogs, and are either lacerations or perforated wounds. In the majority of cases, try to get drainage and keep the wound clean by means of antiseptics; this is best accomplished by putting a piece of absorbent cotton saturated with the solution on the scrotum, and by means of a long-tailed bandage tied around the body the cotton can be kept in place. Where the testicle is badly injured, the gland had better be removed by castration, as it is only in favorable cases that the animal makes a good recovery and the seminal power is retained.

(For further details on the subject consult the chapter on Hernia of the Testicles and Castration.)

Neoformations of the Testicles.—Omitting tuberculous deposits, we find fibroma, sarcoma and carcinoma; the former can easily be felt on the surface of the testicle as distinct circumscribed elevations; the latter two on the other hand are indicated by a hypertrophy of the testicles and the spermatic cord may be involved, and in rare cases both testicles are affected. The testicle may be greatly enlarged, the surface smooth or it may be uneven and irregular. The author has observed only a very few isolated cases of a scrotal cancer breaking through to the outside with the formation of a characteristic ulcer. Rarely do these neoformations involve the scrotum; when they do, they form adhesions and if they make an external opening in the scrotum Kitt has observed that it is extremely difficult to distinguish by microscopical examination the true pathological character of these hypertrophied testicles and place them in their proper class (Orchidarm, Orchidoblastom). Fig. 115 represents one of these tumors, removed operatively by the author. Künneman is also of the opinion that there are no characteristic symptoms for the diagnosis of the particular forms of tumors and that even the microscopic examination offers no definite characteristics especially for sarcomatous and carcinomatous neoformations. Forty per cent (40%) of the cases of tumors of the testicles examined by Künneman were found in displaced testicles. Castration is the only radical method to remove these malignant tumors and it should be done early before the entire region becomes involved.

Concerning other pathological conditions of the male sexual organs of the dog only one more shall be mentioned here, namely, the protracted varicose changes that occur on the scrotal epidermis of older dogs, especially dogs used for draught purposes. These varicose changes sometimes result in ulcerations and profuse hemorrhage (Möller), and sometimes in a markea elongation of the scrotum. According to Uebele the latter can be corrected by dissecting the uninjured tunica vaginalis free and performing a resection and suturing the scrotum shut. The parlysis of the penis (prolapsus of penis) described recently can be treated by massaging, faradization, irritating ointments or by constricting the external orifice scar traction. The most important thing is the treatment of the primary disease. Information concerning inguinal and scrotal hernias will be found elsewhere in the book.

Castration of the Male.—The animal is prepared by washing the region of operation with an antiseptic solution, put the animal under ether or inject the region with 4 per cent cocaine, turn on his back, an incision is made, first on one testicle, in a longitudinal direction through the skin of the scrotum and vaginal tunic, and the posterior portions of the cord are cut through and the anterior or vascular portion is ligated with silk and cut through just below the ligature and the other testicle treated in the same manner (Fig. 111), in young animals the cord is simply scraped through or twisted off by means of tortion, the part containing the vessels being held firmly between the thumb and index finger of the left hand or compressed with forceps (tortion pincer, artery-clamp), and then twisting the testicle with the right hand until it tears off, and the opening in the scrotum closed by means of a stitch, and covered with iodoform or a disinfectant dusting powder, and a truss bandage applied. The wound is dressed daily, it heals up rapidly. It is well not to allow the bandage to remain on too long, as it is apt to irritate the animal. Another mode of procedure is to make an incision on the median line of the scrotum, but before doing so tie a string around the scrotum just above the testicles, so that when the incision is made the testicle will not be drawn beyond reach; having made the incision on the median line, cut through the tunica, draw out both testicles, twist them round several times, making a spiral of the cords, then cut the cords as high up as possible with the ecraseur or a pair of emasculating scissors. The hemorrhage is slight and much better than the complication of the ligature hanging in the wound.

Cuterebro Emasculator

(*Emasculating Bot Fly.*)

This parasite which is frequently observed in squirrels and occasionally in rabbits has been observed in two cases in the dog where the grub of the parasite was found imbedded in the scrotum. These were in English setters and the dogs had been in the Southern states for some time.

The scrotum swells slowly, beginning at the dependent portion, until a round, firm mass, resembling in size and shape of the ordinary "warble" seen in cattle's backs, but not quite so large; it apparently gives the animal no discomfort unless the parasite should act as an irritant and form an abscess; when this occurs it is followed by great irritation of the parts, and subsequently sloughing of a portion of the scrotum and destruction of the testicle. The treatment consists in finding the opening or vent of the parasite in the skin and carefully enlarging it, taking care not to penetrate the larva, when it can be pushed out and the wound cleaned with a solution of peroxide of hydrogen. If the grub is punctured and it collapses, the remaining portion of the parasite must be carefully removed, as it causes great irritation if allowed to remain. Dress daily with a 1 to 3,000 solution of corrosive sublimate.

DISEASES OF THE FEMALE SEXUAL ORGANS.

DISEASES OF THE VAGINA AND THE UTERUS.

INFLAMMATION OF THE VULVA AND VAGINA

(*Vulvitis and Vaginitis.*)

Inflammation of the vulva and vagina results, as a rule, from difficult labor or unskilled assistance during delivery, and in rare cases as a result of improper copulation, or when young bitches or very delicate animals are having their first litters. In the acute form the labia pudendi are tumefied and painful to the touch. The condition is indicated by a whitish, purulent discharge, in some cases being fœtid, which is generally licked off by the animal. The examination in the larger animals can be made by means of a speculum (**Fig. 116**). On examination of the vagina we find it intensely red and inflamed and covered with a grayish, mucous discharge; the mucus is also grayish in color, and has in some cases striated lines or petechial patches. In chronic cases there is a constant discharge from the vulva of a whitish-yellow muco-purulent fluid which agglutinates the hair in that region, and the animal is constantly licking the discharge; the mucus is sometimes grayish in color, and carcinoma is often present. (See chapter on Tumors for further details.)

FIG. 116. Vaginal speculum.

The therapeutic treatment consists of daily injections and irrigations of astringent or disinfectant washes of sulphate of zinc (1 per cent.), or permanganate of potassium solution, boric acid, or creolin, lysol, bacillol, etc., or a solution of acacia (mucilage) is useful. In chronic cases use alum, 2-3 per cent.; nitrate of silver, ½-1 per cent. solution, or sulphate of zinc, 1-2 per cent.

Prolapse of the Vagina and Uterus.

(*Prolapsus Vaginæ; Prolapsus Uteri.*)

Prolapse of the vagina is more common than prolapse of the uterus; it is seen especially in young bitches, frequently at the termination of heat and occasionally at the latter period of pregnancy; it rarely occurs as a result of parturition. In some instances it is accompanied by serious alterations of the vagina, especially hypertrophic alterations, and also in rare cases we find polypus formations. As a rule there is more or less protrusion of the vagina through the vulva, appearing in the form of pear- or flap-shaped, red, inflamed tissue covered with mucus (Fig. 118). In very rare instances the prolapse is so great that the os of the vagina can be seen through the external opening. When the vagina has been partially prolapsed for some time, the exposed portion becomes so infiltrated and hypertrophied that it becomes impossible to reduce it. Care must be taken to differentiate between a pedunculated fibroma and the prolapsed vagina, and instances are not rare where the vagina is prolapsed and a tumor whose existence is never suspected also accompanies it.

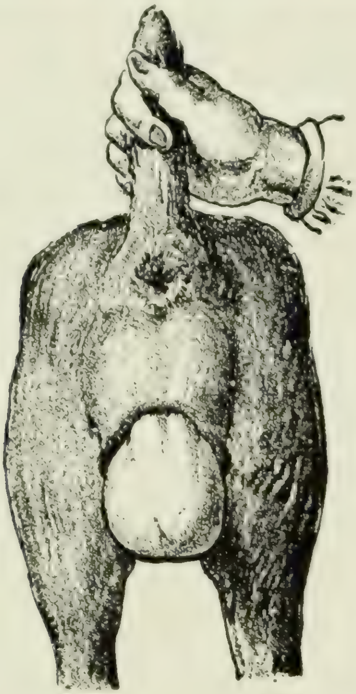


Fig. 118.—Prolapse of the vagina.

The prolapse of the uterus in the dog is practically impossible, for the reason that the uterus itself is merely a body in name, and really the uterus consists in the horns, the true body of the uterus being a small body from which the horns bifurcate almost at the os (Fig. 118a).

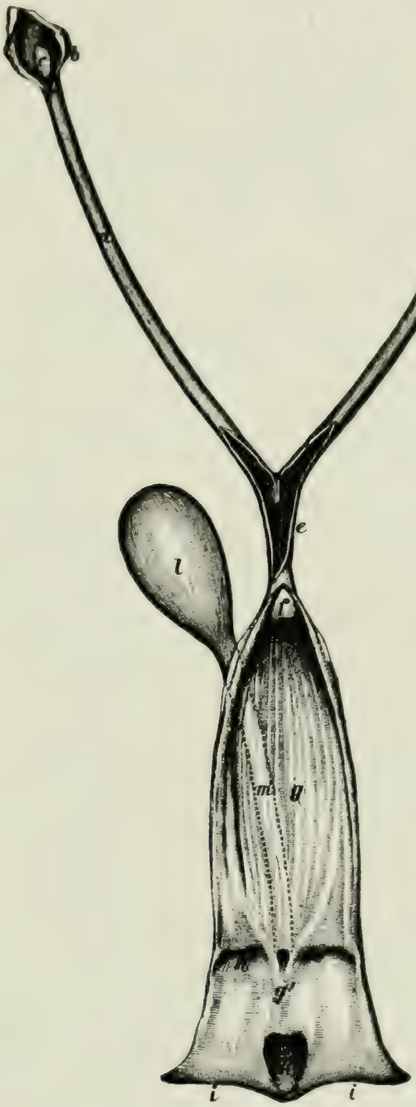


Fig. 118*a*.—The genito-urinary organs of the bitch: *a*, ovary covered with capsule; *b*, capsule of ovary; *c*, ovary; *d*, horns of the uterus; *e*, body of the uterus; *f*, os uteri; *g*, vagina; *g*, opening of the urethra; *h*, clitoris; *i*, *i*, vulva; *l*, bladder; *m*, urethra.

The therapeutics of prolapse of the vagina is practically that used in prolapse of the anus and rectum. In slight cases after copulation, the animal should be kept quiet, and it will then soon disappear; the application of vaseline or boracic acid ointment, however, may be used. The retention of the vagina is much more difficult than returning it to its normal position; the protruded portion is carefully washed with warm water and an antiseptic solution of boracic acid or creolin solution and the animal placed so that the hind quarters are elevated for at least an hour. If there is great tumefaction, the protruded portion must be massaged for some time to lessen the volume of the enlargement before attempting to reduce it. If that is not sufficient, and the protrusion recurs in a short time, it is well to introduce a tampon into the vagina or pack the vagina with antiseptic gauze or cotton and stitch the lips of the pudenda in such a manner as not to interfere with the normal passage of urine, and assist defecation and prevent straining by the administration of laxatives or using glycerine suppositories. The writer generally uses the following method: After returning the vagina to the normal position, he puts two stitches in the pudenda and leaves them there for three days, when they are removed.

In one case where there was great thickening of the walls of the vagina and reduction of the prolapse was impossible, and another where the vagina prolapsed immediately after the stitches were removed after being there for several days, the writer performed a partial amputation, taking out an elongated piece of mucous membrane and sewing it up by a continuous stitch of cat-gut, which was followed by good results.

Reduction of the uterus is much more difficult, and in the majority of cases it is impossible except by laparotomy. The prolapsed portion should be lubricated and gradually worked back, and after the fingers cannot reach any further, a tallow-candle must be inserted and the horn pushed back as far as possible. If this method is not successful, laparotomy should be performed in the manner spoken of in hernia. An incision is made into the abdominal wall and the finger inserted until the Fallopian tube is felt, and then the animal is held up by the posterior extremities, and by gradual tension the horn of the uterus is pulled back into position and the opening in the abdomen is closed. The rules named for retaining the vagina are then to be followed. The uterus can be retained in position by making an opening in the median line of the abdomen and pulling the horn into position and then stitching the horn to the upper part of the abdominal wall. It is needless to say that the stitch must be of cat-gut.

Neoformations of the Vagina.—The tumors found in the uterus are lipoma, fibroma, papilloma, and carcinoma. The fibrous are frequently observed; they may appear either singly or multiple, varying from the size of a pea to as large as an egg; they are hard, smooth on the surface and usually pedunculated, occasionally protruding from the vaginal opening, and are not at all sensitive. They frequently present ulcerated surfaces.

The papilloma are rarer, found generally at the interior of the vagina and in the form of warty, irregular elevations resembling a raspberry, or, if larger, a cauliflower; the tumors closely resemble true carcinoma, so rare in the dog. Of true cancer the writer has observed only one case in a St. Bernard; this neoplasm occupied the inferior lateral floor of the vestibule of the vulva; it was soft and spongy, irregular in form, bleeding easily to the touch, fœtid in odor, the cancer had a broad base, was hard and indurated, and extended some distance into the tissues. True cancer is very rare and is indicated by a fœtid ichorous discharge from the vagina. The vagina can either be examined by the introduction of the index finger, or using a speculum. Frohner advises digital examination. The cancers occur in single or multiple groups, soft excrescences attached to the mucous membrane of the vagina which are not painful to the touch but bleed easily on manipulation. These cancers vary in form; some are rough with irregular elevations like a cauliflower; they may be polypus in shape, or they may occur as a diffuse mass of irregular infiltrations spread over the mucous membrane of the vagina. Where it can be done these tumors should be removed as early as possible. Sarcoma (lymphosarcoma of the vagina are of significance because they are observed in similar form on the penis.

DISEASES OF THE UTERUS.

Inflammation of the Uterus (Metritis).—It is a common occurrence to have inflammation of the uterus after protracted labor. The disease can be subdivided into the following varieties, catarrhal and septic, according to the exciting causes:

(1) **Catarrhal Metritis. Superficial Metritis, Catarrh of the Uterus.**—In this condition the disease is limited to the mucous membrane and presents the same symptoms as are seen in all catarrhal inflammations of mucous membranes; the course may be acute or become chronic; the causes are mechanical injuries which the uterus may be subjected to during labor or immediately after; cold may be said to be a predisposing cause. While retention of the placentæ should be mentioned as a possible cause, this condition itself is rare in the dog. Metritis may also occur in bitches that have never been bred.

The **clinical symptoms** are as follows: The vulva is slightly reddened and swollen, and there is a copious discharge from the vulva; this is purulent, sometimes bloody or slightly putrid, and is much increased in quantity after the passage of fæces or urine; but the animal licks it off so soon that the observer must look immediately after each evacuation or it may escape his notice. Some bitches carry their tails in a curved position when suffering from this condition, are uneasy and occasionally strain; some animals have complete loss of appetite, and in some cases slight fever is present. Frequently, the discharge lessens and recovery follows in a few weeks or it may become chronic, and there is an abundant discharge of white or whitish-yellow purulent creamy fluid (leukorrhœa, fluor albus); the animal becomes emaciated, loses flesh and has a stairy, rough coat. In some cases there is a gradual swelling and obstruction of the os uteri, the purulent material is held in the uterus (pyometra), pyemia develops, and death occurs in a short time. External manipulation through the abdominal wall may find the uterus greatly increased in volume, and on digital examination per rectum the vagina is found to be drawn into the abdominal cavity.

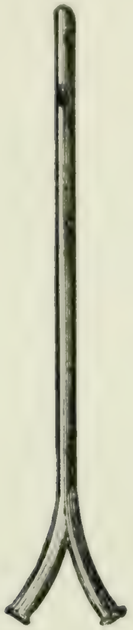


FIG. 119. Double catheter for washing out the uterus.

The therapeutics consist in tepid injections of non-poisonous antiseptic fluids, such as permanganate of potassium (0.1 per cent. solution), boric-acid (2 per cent.), and creolin (1 per cent.), tannic acid (2 per cent.), solution of corrosive sublimate (1 to 2000), lysol (½ per cent.). In more chronic cases, alum (1-2 per cent.), tannic acid (1-2 per cent.), sulphate of zinc (1 per cent.), silver nitrate (½ per cent.). In using these solutions it is best to use the irrigator with the two catheters (Fig. 88); in one opening the fluid is forced through into the uterus and allowed to circulate and flow out of the other opening. The uterus must first be thoroughly rinsed out with luke-warm water before the medicinal irrigations are applied. If the os uteri is contracted, it can be dilated by means of a bougie (tupelotent). In the chronic form (dysmenorrhœa) we should use injections of ergot or sabine oil. In chronic cases, with persistent fœtid discharge, the uterus should be removed.

(2) **Septic Metritis. Gangrenous, Ichcrous Inflammation of the Uterus** (*Puerperal Fever*).—Septic inflammation of the uterus should be considered a disease of wound infection in which we find intense irritation of the uterus and vagina, accompanied by violent constitutional disturbances. During and after labor septic materials find their way into the uterus and, owing to the condition of the uterus at that time, when it is practically in the same condition as an open wound, the septic materials are taken up very quickly and every condition is favorable for their propaga-

tion. Collections of blood, decidual tissue, etc., exposed to the air decay very quickly, and where there is any erosion of the mucous membrane of the vagina or the cervix, or even the uterus at the points of placental attachment, the poison is taken up and enters the tissues and is carried into the circulation. The eroded portion of the uterus that has taken up any of the septic material soon presents an ulcerated surface which is covered by a necrotic or diphtheritic coating, and in some cases the vagina becomes intensely swollen, is dark brown or reddish-brown in color, and covered with spots of diphtheritic ulcerations.

The inflammatory process extends rapidly from the mucous membrane into the deeper tissues, affecting the muscular and the pelvic cellular tissues, and also the lips of the pudenda, and from the internal surface of the uterus it extends to the uterine muscles and the broad ligament, and in acute cases to the serous covering of the uterus and the peritoneum. When the acute symptoms are present (perimetritis and parametritis) ptomaines and septic material enter the circulation and cause acute septic fever. The prognosis is generally unfavorable.

Clinical Symptoms.—The vulva and the mucous membrane of the vagina are swollen and livid red, and discharge copious masses of discolored, fœtid pus. In the earlier stages the animal shows great pain on pressure to the abdomen; the pulse is very fast, thready and finally becomes imperceptible. The respirations increase in number. The temperature in the early stages is usually much increased, but soon falls, becoming subnormal toward the end. The mucous membranes of the mouth and conjunctiva are livid, an offensive diarrhœa commences, and the expired air from the lungs smells of decayed tissue.

When the animal presents the acute symptoms early and does not eat or drink from the onset, it soon becomes comatose and dies in from twenty-four to thirty-six hours.

Therapeutics.—In such cases to get any favorable results treatment must be prompt and energetic. The uterus and the vagina must be thoroughly irrigated with antiseptic fluids, and also the general treatment indicated in septicæmia. For antiseptic irrigating fluids we use creolin, 2 per cent. solution; lysol, 1 to 100; actol (1 to 1000); formalin (0.3 per cent.); corrosive sublimate, 1 to 2000 solution. First irrigate the uterus with warm water using the double catheter shown in Fig. 88, and clean it thoroughly until there is no discoloration in the escaping fluids; then inject the medicated solution into the uterus several times; repeat this several times daily. As a stimulant, use whiskey, brandy, camphor, either internally, or subcutaneously; the latter is best, as you are apt to get quicker results, and you also avoid the danger of the animal vomiting it, which it is very apt to do. Ergot or caffein are used with some success where there is great weakness of the heart. Uebele recommends enema of argentum colloidale 1.5, aquadest, 100.

Externally hot dry packs may be applied to the abdomen. Intravenously Incarbon (Merck) can be tried.

℞. Camphor pulv.,	0.2
Gummi acacia,	0.6
F. chart. No. xii.,	
S.—One powder every two hours.	

Prolapse of the Uterus. Prolapsus Uteri.—This condition is extremely rare and occurs only during or immediately after delivery. From very severe traction during labor or awkward assistance, particularly of the last fœtus, the horn of the uterus everts, passes beyond the os uteri and vagina (invertio uteri without prolapse, incomplete prolapse of the uterus) or passes entirely beyond the vulva and generally carries also a portion of the uterus with it. It protrudes out of the vulva in the form of a tumor-like mass, the mucous membrane being tumefied and livid in color. The membrane may be excoriated in places and in extreme cases gangrenous.

Treatment.—This is practically the same as prolapse of the vulva or rectum. The protruded portion is carefully bathed with mild antiseptic solutions such as boracic acid and endeavor to return it to its normal position by even pressure of the fingers; if this succeeds, place the animal so that the hind quarters will be slightly elevated, inject a solution of boracic acid into the uterus, and followed by a hypodermic injection of morphia which tends to overcome straining on the part of the animal. If the prolapse recurs it may be reduced and a sponge or oakum tampon inserted into the vagina and the orifice closed with sutures (see page. 213). If the uterus persists in resisting the above mentioned treatment, the animal should be etherized, the abdomen opened on the median line, and the uterus or Fallopian tube drawn down to the opening and tied to the abdominal opening by means of sutures, taking care not to include the mucous coat of the intestines in the stitch. If gangrene has set in, the exposed uterus must be amputated. The exposed portion of the uterus is drawn out, ligatured with strong silk thread, and the dependent portion cut off just below the suture; care must be taken not to include the bladder or the urethra, and the stump pushed back into the pelvic cavity; some operators advise an elastic ligature. Cutting off the prolapsed portion by means of an ecraseur is not to be advised.

Neoformations of the Uterus.—Fibromas (myofibroma) are found most frequently in the uterus and sometimes attain a considerable size. Cysts, sarcoma and carcinoma are also seen; the latter are generally found in the form of soft, loosely organized masses, filling up the entire lumen of the uterus, occasionally involving the adjacent organs (the intestines and bladder). The only radical means of treatment is to extirpate the entire uterus. The subcutaneous injection of ergotin may be found useful in checking the growth of myofibroma and possibly removing them.

Obstetrics.

As a rule, the bitch has her pups without any difficulty. The period of pregnancy varies from fifty-eight to sixty-two days (Dun kept a record of 189 bitches and found the average period was 63.28 days, the maximum being seventy-one days and the minimum being fifty-three days) when she generally seeks a quiet place and drops from one to eight (sometimes more) blind pups, which open their eyes in from ten to twelve days, the period of whelping being from one to six hours (quite frequently lasts ten to twelve hours), in rare cases eighteen to twenty-four hours. The labor pains generally appear from three to ten hours before birth, and

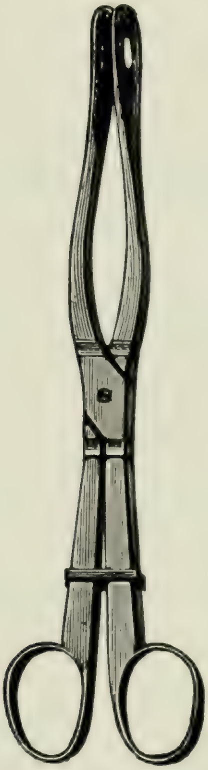


FIG. 120.—Obstetrical forceps. (*Möller's.*)

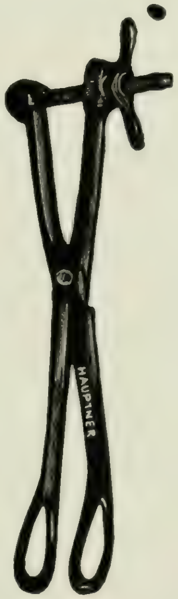


FIG. 121.—Obstetrical forceps. (*De Bruin's.*)

are indicated by the bitch being very restless, going into dark corners, or scratching as if to make a bed, she whimpers, moans, groans, assumes the position as if urinating or defecating, and frequently passes small amounts of urine, and on putting the hand on the abdominal walls, the fœtuses are found to be showing considerable movement. The retention of the whole or a portion of the placenta is very rare in the bitch, and when it does occur it is indicated by the following symptoms:—great depression; no milk in the mammæ; the bitch pays no attention to the pups; frequent contraction of the uterus similar to labor pains; entire loss of appetite; pain on pressure of the abdomen. The temperature was normal at first, but gradually increased; the pulse was quick and hard, and a fœtid discharge from the vulva.

The short but strong umbilical cord is torn during labor or bitten off by the bitch immediately after birth, and the entire mass of placenta and amnion is eaten by the mother. After the birth of the pups there is slight lochial discharge, bloody in the onset and finally purulent; this discharge lasts for several days.

The normal course of birth may be changed by the following conditions: 1. The labor pains may not be strong enough. 2. There may be a narrow, contracted pelvis. 3. The vagina may be lessened in diameter by cicatricial contractions, tumors, etc. 4. The fœtus may be very large, a monstrosity. 5. Fœtus may be presented in an irregular position. 6. Torsion of the horn; this is extremely rare. As a rule, the bitch does not require the assistance of the veterinarian, although very small animals and the higher bred animals may need some assistance, but it is best to leave the bitch as quiet as possible and not to interfere with her in any way. Small bitches sometimes have very large pups, the size of the male has also an effect on a litter. When the labor pains are weak or entirely absent, an examination of the uterus is made by introducing the index finger, well oiled, into the vagina, the other hand putting pressure on the abdominal wall; and if we find the fœtus is in position, the head is felt in the dilated os (the breech presentation is also seen, but is rare) and the pelvic cavity normal, artificial assistance is contraindicated, at least for an hour or two; if at the end of that time the head has not advanced, ergot must be given internally or, subcutaneously, massage of the uterus through the abdominal wall, and applications of warm cloths to the abdomen.

One writer speaks very highly of glycerine in 1 to 10 solution with warm water as an agent to encourage the contraction of the uterus in cases of difficult parturition; it is injected directly into the uterus. If the animal is depressed and weak, administer stimulants—whiskey, wine, or alcohol or spirits of camphor internally or subcutaneously—

and if these fail to produce the birth of the fœtus it may have to be removed by forceps, of which there are a variety, the simplest of which are the most useful, hooks—(Fig. 122)—or the fœtus may be noosed by means of a copper wire or cotton cord held in a tube (see Fig. 123). Caution is urged in the use of wire nooses on account of possible injury to the fœtus.

Fluid extract of ergot 1.0 to 2.0 every half hour, or if the animal vomits give 0.50 to 0.75 of ergot hypodermically every half hour.

In some cases where the bitch is observed by the veterinarian, it is well to irritate the vagina and uterus between the birth of each puppy, and particularly so after the animal has delivered the last fœtus; the best solution is a mild solution of corrosive sublimate 1 to 3000, or boracic acid solution. When the fœtus is dead and the membranes are commencing putrefaction, the constant application of antiseptics must be made until either the fœtus and membrane are expelled or removed surgically.

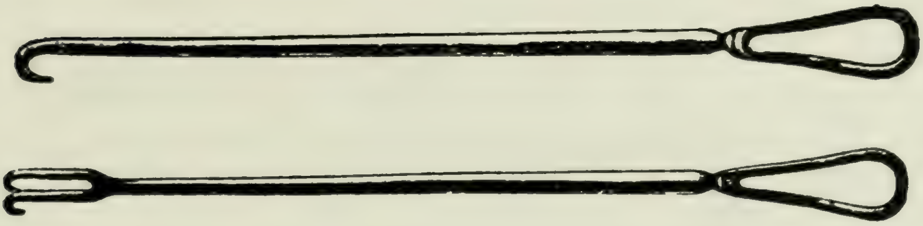


FIG. 122.—Retractors, single and double.

When the fœtus is in an irregular position, and after failing to remove it by means of forceps, finger, loop, etc., or if the fœtus is so very large that it is impossible to get it through the pelvic opening, or if it cannot be reached, so that it can be cut into sections, or if the pelvis is contracted, due to permanent cicatricial contractions, or a tumor present in the uterus or vagina, we must perform the Cæsarean section.

Cæsarean Section, Hysterotomy, Sectio Cæsarea.—This is not necessarily a dangerous operation, providing the operation is performed before the animal is in a state of collapse, or the fœtus is dead and commencing to decay, or the temperature has not risen much above normal. In all cases strict asepsis must be maintained. Empty the bladder and the lower bowel; and having washed out the genital passages with an antiseptic solution, put the animal under ether. The bitch is laid on her back, the legs are held by an assistant, the forelegs together and the hind legs wide apart. The region where the incision is to be made should be thoroughly washed and the hair removed from the part. Make an incision on the median line of the linea alba anterior to the umbilicus (some operators prefer the flank incision) with a sharp-pointed bistoury, and cut into the abdominal cavity, taking care not to injure the intestines or uterus; then insert a probe-pointed bistoury and make the opening larger, cutting toward the pubis; then cut through the omentum; the uterus is now visible and can be lifted out and the fœtuses can be felt in the uterus, separated by a constriction of the body of the horn. Pull the uterus out of the opening as far as possible and have an assistant keep the opening of the abdominal wall closed, so as not to allow the intestines to escape, and also to avoid any of the fluids from the uterus falling into the cavity; and by means of a bistoury open the uterus by making an incision through its convex wall; the opening should not be any larger than is necessary to get the fœtus and the membranes out. It is not necessary to make an incision in the horn over each fœtus, but after one fœtus is removed the others can be pushed toward the opening and removed through it, taking care to remove the membranes also. The uterus is now thoroughly disinfected with corrosive sublimate solution (1 to 5000) or boric acid, 2 per cent., or creolin; and close the incision by

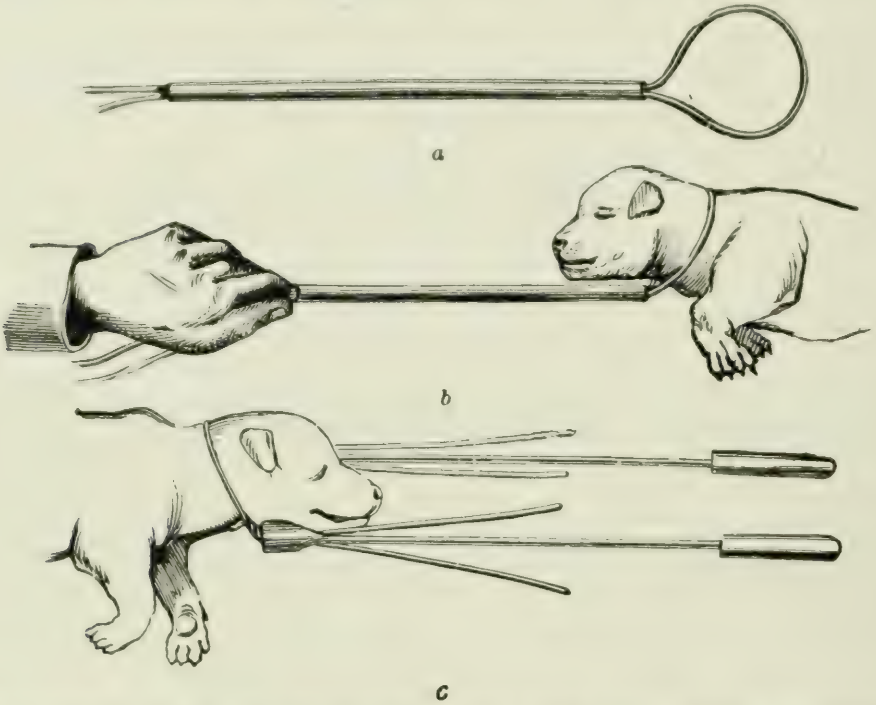


FIG. 123.—Apparatus for the extraction of the fœtus and method of extraction: *a*, Brulet's apparatus; *b*, method of application; *c*, Defay's apparatus.

means of a Lambert's suture (using the stitch illustrated in Fig. 40, page 109), using catgut ligature. If the other horn of the uterus contains fœtus, it must be treated in a similar manner, irrigated and closed, then sew up the abdominal muscles by an interrupted suture, using silk. The abdomen is covered with a piece of absorbent cotton soaked in a mild solution of corrosive sublimate and held in position by an eight-tailed bandage of muslin tied over the back. This has to be dressed daily. The animal must have absolute rest and be fed sparingly on food that is easily digested and not apt to constipate or ferment. Meat juice or extract is the best; vegetables are contraindicated.

Removal of the Uterus, Hysterectomy.—This operation is performed in inguinal hernia of the bitch, with strangulation, in uterine tumors, and chronic catarrh of the uterus, and when after the abdomen is opened as in the operation just described and it is found that the uterus is either lacerated, necrosed or that the uterus is in such condition that if it is not removed it will endanger the life of the animal. Open the abdomen on the linea alba or the flank, the former is much more satisfactory and to be preferred, and the uterus is brought down out of the opening, and a double ligature of silk or catgut is put on the horn close to the ovary, or, better still, remove the ovary, then a double ligature is put on the uterus, close to the vagina. The ligature may also be applied at the uterus divisus and the remaining stump or uterus proper stitched in between the muscle walls of the abdominal wound. When the uterus is filled with fœtus, it is best to empty the uterus, taking care not to allow the escaping fluids to flow into the abdominal cavity; the ligated horn and uterus are cut between the double ligatures, and the broad ligament separated, and it is wise to apply the thermo-cautery to the stumps of the horn and the uterus, then close the abdominal wound, bandage the abdomen and treat the animal as in any grave surgical case.

Irregularities of Sexual Instinct.

Absence or Loss of Sexual Desire.—This condition may result from a variety of causes: (1) general debility, (2) anæmia, (3) irregular or improper food, (4) phlegma, especially in over-fed animals, (5) too frequent sexual intercourse, as dogs in the stud, that have suddenly become popular and have a great number of bitches sent to them, (6) onanism, where animals have no intercourse, and learn to masturbate on objects slightly elevated from the ground, a rung of a chair, the shaft of a wagon, and in the kitchens of families, where small pet animals are kept, the servant maids hold up their foot and encourage the dog to masturbate on that until they are exhausted, (7) from disease of the spine or of the genital organs. In the bitch sterility may result from catarrh of the uterus or vagina, causing a discharge of acid mucus, that destroys the spermatozoa. Certain male dogs become so violently excited that they are unable to perform the act properly, or there may be partial loss of erectile power in the corpus cavernosum and the dog does not hold long enough, for the sperm to be secreted and it is ejaculated after they separate.

Therapeutics.—If there are any pathological alterations they should either be alleviated or the case may be such as to be impossible to alleviate, or we may administer an aphrodisiac to the animal for some time previous to the time the animal is to serve the bitch. Tincture of cantharides 2 to 10 drops once or twice daily in wine or barley water or hydrochlorate of yohimbin two or three times daily, an eighth to a half tablet which contains 0.01. in solution of acacia. (Double dose of yohimvetol.) In the bitch yohimbin should be administered for five days and then the bitch is put with another bitch in heat, this as a rule, produces sexual excitement in ten days. If sterility is due to acidity of the secretion of the vaginal mucous membrane, irrigations of alkalines are advised such as carbonate of soda, 1 per cent., bicarbonate of soda 2 to 3 per cent.

Excessive Venereal Excitement. Satyriasis and Nymphomania.—This may occur as a result of certain diseases of the genital organs, but frequently occurs in the male, from unknown causes, (see also priapismus). Venereal excitement is a common thing in male dogs, their actions, in play or in excitement all tend toward stimulation of the sexual act, and frequently dogs learn to practice onanism, gradually becoming emaciated, accompanied by dulness of the senses, weakness or loss of sexual power, and frequently, partial or complete paralysis.

Therapeutics.—If the venereal excitement is not due to any pathological alteration of the genital organs, the animal should be kept on low diet, very little meat, and the administration of saline laxatives, and the salts of bromide of soda or potassium, and if these methods fail, resort to castration.

Castration of the Bitch (*Ovariotomy*).

This operation is generally performed to avoid the trouble that owners have when a bitch is in "heat," and also tends to make them good quiet house dogs. The operation is a very simple one and not attended by any great danger if the proper antiseptic rules are followed, provided the animal is not too fat, pregnant or in "heat" at the time of operation, or there are no tumors of the ovaries, that by either greatly increasing the size of the ovary or adhering to the adjacent tissues interfere with their removal. Normally the ovaries are small, elongated, somewhat irregular bodies about the size of a small bean, lying posterior to the kidney and encapsuled in a pouch and generally surrounded by fat. The operation is either performed through the flank or on the linea alba, while the animal is either narcotized with morphia or anæsthetized with ether. Before operating the animal should have food withheld for twenty-four hours, and the region of the incision carefully prepared, first by shaving all hair in the immediate region, and then carefully disinfecting it.

Operation on the Linea Alba.—The bitch is given a narcotic, or etherized, or both, and placed on a table on her back and an incision made in the linea alba at the umbilicus, with a sharp-pointed bistoury, and then the opening is enlarged by means of a probe-pointed bistoury, cutting toward the diaphragm, the size of the opening is just large enough to freely admit the index finger. Some operators introduce a sound into the uterus previous to the operation, but this as a rule, is unnecessary, as familiarity with anatomy, will easily detect the difference between intestine and the fallopian tubes. The finger is introduced into the abdomen close against the wall and the horn of the uterus is felt, the end of the finger is hooked under it and drawn toward the opening, and by careful traction, the ovary is drawn toward the opening and cut off with the scissors; sometimes it is necessary to tear the ovary from its attachments to get it to the surface. The same procedure is followed in the other ovary and the wound closed with an interrupted silk stitch.

Many operators perform castration in very young and even in older dogs, by opening the abdominal cavity at the linea alba and ligating the uterus by two catgut ligatures about an inch apart on the body of the uterus, and cut through between the ligatures. This method has the advantage of being very simple, and there is little or no danger connected with it, but the writer has tried a number of cases for experiment and found in a short time a great collection of creamlike matter, gathered at the ligated end of the uterus toward the ovary, and distended that portion very much, which was noticeable by an enlargement of the abdomen. This result can be prevented to a great extent, by ligating and cutting each horn separately, and as high and near the uterus as possible. This complicates the operation, and as the prime object of the operation is to prevent the recurrence of the periods of "heat," as the ovary is not removed by this mode of operating the phenomenon recurs at the regular periods and while it is true it is impossible for the animal to become pregnant, it still is not an operation to be desired.

Castration by Flank Operation.—Many operators advise castration through the flank, and proceed in the following manner: Make an incision in the flank about 4 cm. long, midway between the last false rib and the thigh and the transverse process of the vertebra, in an anterior direction (forward and downward), cutting through the skin and muscular layer; then tear the peritoneum by means of the finger or knife, or lifting the peritoneum by means of a pair of forceps, cut it through with a scissors, then the index finger is introduced into the abdominal cavity, the fallopian tube is found, hooked with the finger the ovary is pulled down to the opening and cut off by scissors or twisted off with forceps, care being taken to remove the ovary entirely. Some authors recommend removing a portion of the horn with the ovary; this, however, is not really necessary. After removing the ovary, the Fallopian tube is traced back to the bifurcation at the uterus, the other tube found and followed back to the other ovary, which is removed in the same manner. In cases where the remaining ovary cannot be reached, laparotomy is made on the other flank, and the ovaries pulled through the opening and then cut off with the scissors, and the wound sewed up as described in the other operation. Friedberger has operated on hunderds of bitches in the above-described manner; he removes both ovaries through the one opening in the left flank. Gunther makes an opening in both flanks, taking one ovary out of each. The subsequent treatment consists of feeding the animal on small quantities of easily digested food, and treating the wound with the regular antiseptics.

DISEASES OF THE MAMMARY GLAND.

INFLAMMATION OF THE MAMMARY GLAND.

MAMMITIS. MASTITIS.

True inflammation of the mammary gland, due to bacterial infection is extremely rare. It may occur, however, in an acute or chronic state as a result of traumatisms, kicks, blows, cuts, or injuries incident to suckling puppies, or congestion of the udder from caking or drying of the milk, and consequently retention and tumefaction, and finally, the formation of abscess of the gland. This condition may be caused by sudden removal of the puppies, or the pups born dead and the udder filled with milk.

The udder may be swollen through its entire length or certain sections may be affected. It is warm and painful to the touch, the affected part is deep red or in white animals, purple red, and the swelling œdematous. Pressure on the nipple causes the milk to flow, and it is thin, grayish white, sometimes very thick and creamy, the latter generally containing pus or is streaked with blood. In more acute cases, there is fever, loss of appetite, the tissues become purple red and it forms an abscess, which fluctuates, points and allows the escape of creamy pus, streaked with blood; it may in some cases become gangrenous and a portion slough out, and in rare cases cause death. Occasionally cases become chronic and certain portions of the gland atrophy, or become corded or nodulated.

Treatment.—The puppies must be removed as soon as possible, the gland bathed frequently with warm water and lead water solution applied, or an ointment of extract of belladonna, 0.05 lanoline 3.0. This is to be rubbed in or if the abscess is commencing to form pus, apply poultices or hot-water cloths, by means of the Priessnitz compress; when the abscess forms pus open freely. The resulting hardening of the gland after an acute attack of inflammation may be removed by the application of iodine painted on once daily for several days, then apply an ointment of iodide of potassium in lanolin one to twenty. This is to be rubbed in and daily massaging of the gland is recommended. If the gland is swollen and hard from loss of puppies, or if one gland is not emptied by the pups, rubbing with camphorated oil, or an ointment consisting of belladonna extract one part and lanolin fifteen parts, with low diet, and mild saline laxatives. The gland may be milked slightly, this procedure must be done very carefully, and then only when absolutely necessary, as it is not advisable to stimulate the secretion of milk. Bitches that are not pregnant frequently have a swelling and enlargement of the udder, six to eight weeks after the "heat" is over. This invariably disappears without any treatment and it is not necessary to treat it in any way, but in very rare cases, if the udder should become congested, it is to be treated as if it were a case of congestion of the gland. Very rare cases have been known where bitches suck the nipples and stimulate the milk, a habit that is impossible to control, except by putting on a spiked muzzle, or getting the bitch pregnant will sometimes overcome the habit.

Neoformations of the Mammary Gland.

Various tumors and enlargements form in the mammary gland, such as fibroma, lipoma, chondroma, osteoma, adenoma, myxoma, sarcoma and carcinoma, and frequently mixed tumors, such as adenosarcomas fibrochondromas, fibrosarcoma, chondrosarcoma, etc., and there may also be cyst formations. Some of these mammary tumors reach enormous sizes, hang down and sometimes touch the ground, (Fig. 124). As a rule these tumors are round; flat tumors as a rule, are rare, these tumors may be round or apple-like externally or they may be nodulated and irregular and fluctuate at certain parts of the tumor. These fluctuating portions may or may not open, and discharge their contents and form an ugly, raw, unhealthy cancerous ulcer, which is constantly licked by the animal and generally we find enlarged infected lymphangitis in the surrounding tissues. Carcinoma is frequently found on bitches that are beyond middle age, in the form of carcinoma fibrosum, or carcinoma schirrosum, or partially as carcinoma medullare or myxomotodes and calcification, or ossification, as well as cyst formations. Enlargement of the regional lymph glands is nearly always observed. The chief danger

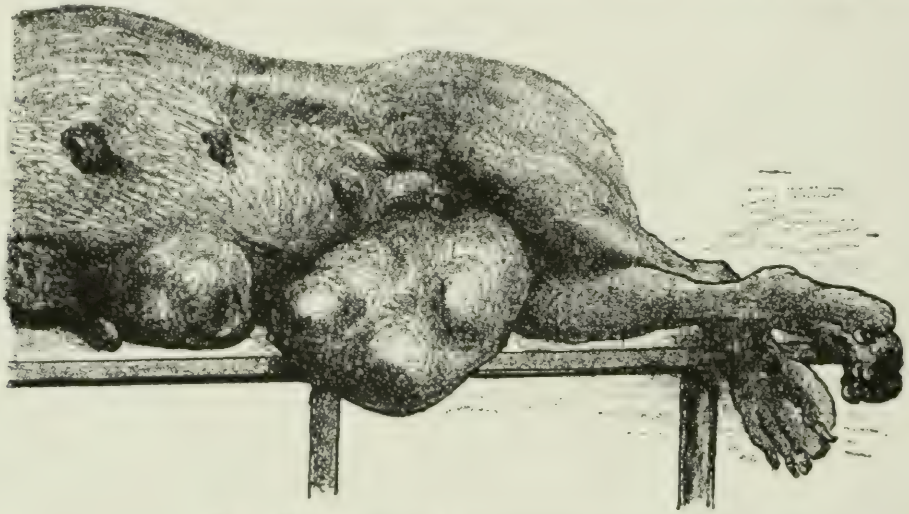


FIG. 124.—Tumor of the mammary gland.

lies in the possibility of metastatic carcinoma of the lungs and liver. In 603 cases compiled by Stecker, 299 (49.5 per cent.) were mammary carcinoma. Among 50 of these cases one was a 4-year-old bitch, eight were 5 years to 6 years old, 13 were 7 to 8 years old, 10 were 9 to 10 years old, three 11 to 12, and four 12 to 15 years. Froehner observed a case of mammary carcinoma in a male dog. Treatment is necessarily operative. Massage and external application of iodine preparations are useless, except in cases when the diagnosis is doubtful. In case of all malignant tumors the entire mammary glands should be extirpated as well as the affected lymph glands. It is often best not to interfere with small benign tumors.

Treatment.—These must be operated on when the tumor is well defined, they can be operated on and removed with comparative ease. When the tumor infects the interior of the gland and is malignant, the entire gland should be removed, and also any infected lymphatics. Frohner found that some of the tumors (carcinoma) become calcareous and unless they are very large are best left alone. Small benign tumors should not be interfered with if they are not growing.

DISEASES OF THE NERVOUS SYSTEM.

Examination of the Nervous System.

Disturbances of the nervous system are marked by impairment of the psychic functions, sensitiveness and motility. In addition there may be, under certain conditions, disturbance of the functions of the eyes, ears, organs of taste and smell and of the digestive system.

Accordingly, a general examination of the nervous system must take into consideration all psychic phenomena, the perceptive faculties in general and in particular (nerves and organs of sense) the extent and character of muscular movements and finally also the seat of the central nervous system (the skull and the spinal column).

1. Abnormal Conditions of the Skull and Spinal Column.

Skull.—General enlargement of the skull with disproportionately large cranial vault is observed in hydrocephalus congenitus. Enlargement of a lesser degree is occasionally observed in rachitic animals and in others whose appearance suggests imbecility. On the other hand an abnormally high occiput, frequently observed in mongrels which are the product of a cross between flat headed dogs and individuals with the opposite peculiarity is not regarded as pathological.

Local enlargements may be due to tumors, abscesses or traumatic influences. Bulging of the frontal region is usually due to empyema of the frontal sinuses or tumors in the latter. Cases of asymmetry of the skull are frequently recorded in literature. Elevated temperature accompanying congestion or inflammation of the brain, especially in acute lepto-meningitis and in sun stroke may be discovered by palpation of the head. It should be remembered, however, that the occiput is normally warmer to the touch than most other regions of the body surface.

Sensitiveness to pressure and the presence of soft areas may be due to traumatisms, possibly also to abscesses at or near the surface of the brain that have caused atrophy of the cranial bones. In rachitic dogs of extreme youth we sometimes observe membranous intervals between adjacent bones of the skull (fontanelle). Sensitiveness to pressure below the base of the ear points to inflammation of the middle ear or to caries of the tuberous portion of the temporal bone which contains the cavities of the ear. Tumors, abscesses and extravasates may under certain conditions be located by the presence of dull percussion sounds in circumscribed areas. Tumors or accumulation of fluids in the frontal sinuses produce similar symptoms.

Spinal Column.—Deviations in form of the spinal column (kyphosis, skoliosis, kyphoskoliosis, lordosis) have already been discussed on page 5. These conditions are occasionally congenital and will be referred to below. A deformed spinal column may be the result of myelitis or the result of rachitis or other conditions which will be discussed below. A deformed spinal column may be the result of myelitis or spinal pachymeningitis or, occasionally, other diseases of the spinal cord. It may also be due to severe cases of rheumatic lumbago (see below). Lateral curvature of the spine is observed in paralysis or in painful affections of one side of the body. The form of torticollis usually called wry neck is sometimes due to unilateral rheumatism of the muscles of the neck. More frequently, however, it is due to fractures, luxations or subluxations of the cervical vertebræ, arthritis, caries or rachitic affections of the cervical articulations, unilateral contractions, ruptures and contractions of the cervical muscles or other accidents. Abnormal postures of the head due to painful conditions near or within the ear cannot, of course, be properly referred to as torticollis.

Distortions of the spinal column induced by tonic muscular convulsions are observed as result of certain poisonings, in cerebro-spinal meningitis and occasionally from other diseases of the central nervous system. Bending, depression or circumscribed elevations of the spinal column may result from fractures, bruises, exostoses, diastases or tumors. Fractures and diastases, if favorably located, may be recognized by rectal exploration. Sensitive areas along the spine, as detected by palpation, occur in spinal meningitis, pachymeningitis ossificans and torticollis. Similar symptoms, more circumscribed however, occur in pressure myelitis, fractures and contusions of the spine. In fractures and contusions there is usually more or less local elevation of temperature. When fractures are present there may be crepitation. By confining manipulation to the exact median line (dorsal processes) sensitiveness of the spine may be differentiated from painful conditions of the adjacent muscles. Abnormal movement of the spine may be observed posterior to fractures or luxations of the spine. Stiffness or rigidity of the spine accompanies chronic inflammatory processes followed by anchylosis (enostosis intervertebralis) and in the course of tetanus. True rigidity may be simulated by painful conditions so frequently observed in the course of disease of the spinal cord and its membranes, in rheumatic lumbago and numerous other affections.

Lumbar Puncture.—This is recommended by Marek for the bacteriological examination of cerebrospinal fluid in intracranial and intraspinal affections. The instrument required is a properly constructed hypodermic needle, 6 to 9 cm. in length, and suitable stilet.

For technique see chapter on tumors.

The fluid which escapes after puncture of the dura mater and withdrawal of the stilet may be collected in a sterile glass tube or drawn directly into the barrel of a syringe. If it is desired to determine the intraspinal pressure before removal of the fluid this may be done by connecting a suitable instrument directly to the free end of the hypodermic needle by means of rubber tubing.

2. Disturbance of the Psychic Functions.

There may be symptoms of excitement or of depression.

Excitement manifests itself by symptoms of alarm, restlessness, aimless running about, barking, howling, crying, not infrequently biting, and points primarily to cerebral congestion and the early stages of inflammation (cerebritis). These symptoms, however, may appear in the course of other diseases also (see p. 2) e. g. rabies. In the latter disease we have in addition, the desire to run away, depraved appetite (eating indigestible substances), a mania for knawing and licking various objects or regions of the body, hoarse voice, peculiar howl, etc.

Depression.—Symptoms of depression frequently follow immediately upon those of excitement and, according to their intensity, are variously designated; stupor (indifference to external influences), somnolency (sleepiness or even sleep—but patient easily roused), sopor (deep sleep—patient not easily roused or only temporarily), coma (complete loss of consciousness). Symptoms of this nature manifest themselves in the various diseases of the brain and its envelopes. Thus in injuries and concussions of the skull or brain, as well as the more serious infectious diseases (distempter, Stuttgart dog plague, septicæmia, etc.), high fever, poisonings with narcotic substances, uremia, icterus gravis, diabetic coma, acute anemia and all diseases in the death struggle. Temporary disturbances of consciousness like dizziness, fainting or syncope, are occasionally observed following great excitement or intense pain (e. g. during operations). Such symptoms, however, may also be due to anemia, contusions, hemorrhage, certain poisonings, abscesses, tumors of the brain, especially of the cerebellum, irritation of the external auditory meatus, of the nasal mucous membrane, uncompensated defective heart action, etc. Dizziness or fainting due to defects of the heart usually occur when animals are moving about but these symptoms are not strictly included in the usual definition of the terms. Cysticerci in the brain have also been observed to cause attacks of syncope, involuntary or forced movements, etc. Idiotism may be observed as a result of distemper. The animals fail to recognize familiar objects or persons, stumble or thump against objects, have a dull behavior and stupid look.

3. **Disturbance of Sensitiveness.**—This is not easily recognized in the dog. In all instances it is advisable to cover the patient's eyes, and compare the sensitiveness of the affected side with that of the healthy one. In cases of hæmaphraic diseases, we test the sensitiveness of the skin by pricking it slightly with a needle or letting cold water drop upon it, so as to produce some irritation or symptom of pain. A test may also be made by means of a battery; still this method is not as reliable and practical as the needle and cold-water test.

Total anæsthesia occurs, as a rule, from poisoning, and must not be mistaken for a want of reaction, when in a comatose condition. **Local anæsthesia**—that is to say, a more or less circumscribed or disturbed zone of sensibility—may be found in any part of the body. In such a case, if anæsthesia corresponds with a region of a special nerve or mixed nerve, or if it is extended over several nervous regions, or if it is even double-sided, we can distinguish it as peripheric anæsthesia. **Peripheric anæsthesia** indicates an injury of the terminal ends of the sensitive nerves and originates through local influences, intense cold, acids (especially carbolic), also alcohol and certain narcotics (especially cocaine). Peripheric anæsthesia may be caused by some traumatism, compression, malformation, or inflammatory exudates; also through inflammations, such as degenerating process, etc., of the peripheric nerves. **Spinal anæsthesia** is seen and, as a rule, is double-sided; due to compression of the nerve or the spinal cord. Cases of cerebral anaesthesia are caused by hemorrhages, tumors, inflammations, etc., in the zone of the sensitive nerves. It may also be caused by the effects of various poisons—chloroform, ether, alcohol, morphia, or bromine.

Hyperæsthesia.—This is an increased sensitiveness of the cutaneous nerves, and is, as a rule, found in the early stages of certain diseases of the spinal cord. It is very rarely seen in the later stages of such diseases. In rabies it is indicated by gnawing of certain portions of the body. and in neuritis and secondary paralysis.

4. Disturbances of motility appear in paralysis and convulsions of the affected muscular system.

Paralysis.—We generally make a distinction between paralysis and lameness, that is to say, an entire loss of movement, and paresis or weakness, which is simply due to debility. In the first case there is not the slightest movement performed in a muscle or a whole group of muscles. In some cases, there are slight muscular movements, but they are weak, without strength, and do not last very long. In order to determine the origin of paralysis, it is necessary to have some knowledge of the psychomotor centres. These centres are located in the cerebrum, and are called the cortico-muscular leading tracts. Up to the present time they have definitely located the following motor centres in the external surface of the cerebrum, the position of which is indicated in figure 92: 1 is the centre for the movements of the muscles of the neck; 2 is that of the extensors and adductors of the anterior limb; 3 is for extending and turning the anterior limbs; 4 controls the movement of the posterior limbs; 5, the facial muscles; and 6, the lateral movement of the tail; 7, for the retraction and adduction of the anterior limbs; 8, for elevating the shoulders and stretching the front legs (walking); 9, for dilating and contracting the orbicularis palpebrarum and zygomaticus muscles. In the front of 9 we also find the centre for the movements of the tongue. Between the anterior and middle portion of 9 is for closing the jaw. On irritating 9 we have a retraction and elevation of the corners of the mouth. By irritating 6 the mouth is opened and the tongue is moved. *c,c* causes a retraction of the corners of the mouth; *c* lifts the corners of the mouth and half of the facial muscles as far as the closing point of the eyelids. The middle *c* (on irritation) opens the eye and dilates the pupil.

Any disease which becomes located in any portion of this cortico-muscular brain centre and inflames or stops the power of these centres must lead to paralysis of the centre which it controls. We therefore can locate any disturbance in the motor centres of the brain by the paralysis which occurs in certain parts of the body. A diseased condition of the covering of the brain, if not very extensive, generally causes the paralysis of one part of the body, as the single motor centres are separated and very distinct from one another. Diseases of the brain, when they occur in the inner surface between the capsules and the pyramids, where all the motor fibres are close together, cause a more or less complete paralysis of one side of the body. That is to say, a hemiplegia (affecting one side of the brain) causes the paralysis of the muscles of the other side of the body. For instance, if the disease is located on the left side of the brain, the muscles of the right side become paralyzed. In diseases of the spinal cord the muscles affected are on the same side, except in the case of diseases of the cervical portion of the spine, when, as a rule, paralysis is seen in all the extremities, and in disease of the lumbar region paralysis of the posterior extremities is seen. We therefore summarize in a general way that hemiplegia is usually a form of cerebral paralysis (of the controlling centres); paraplegia indicates a diseased condition of the spine; and monoplegia is due to a paralysis of the brain as well as the spine. This description gives only the fundamental theories on this subject. Concerning more precise details we would direct our readers to some one of the various physiological text-books.

The most important peripheric paralyses which have been observed in the dog (by traumatism, compression, or exudation, inflammatory or degenerating processes of the affected nerves) are as follows:

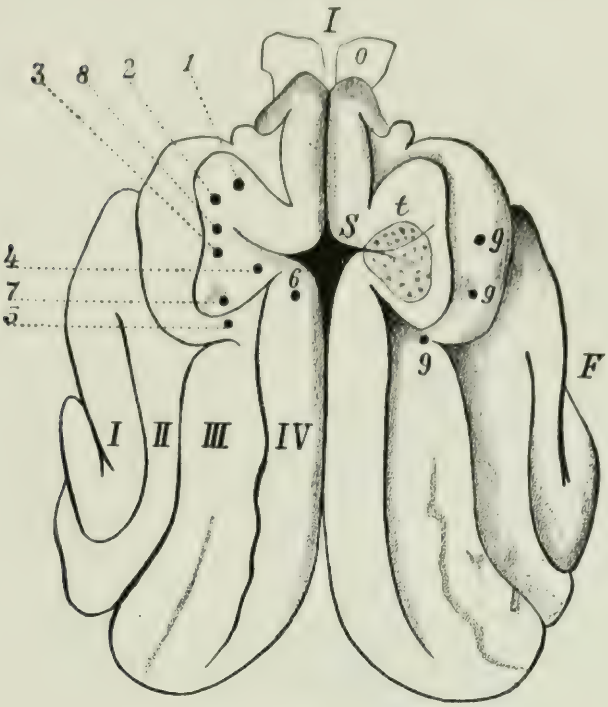
1. *Motor Trigeminal Paralysis.* (Paralysis of the lower jaw.)—The lower jaw hangs down; mastication is impossible; saliva runs out of the mouth. This condition occurs very frequently as a symptom of rabies. In rare instances it has been observed as a result of some other disease.

2. *Paralysis of the Anterior Limbs.*—The front legs hang inert and all the joints flex very easily.

3. *Paralysis of the Posterior Limbs.*—The hind legs are dragged along the ground, the paws being flexed and drawn backward. If the paws are drawn forward and this flexion overcome, the animal is able to stand on its legs if the body is held.

4. *Paralysis of the Cruralis.*—In this condition the animal does not use the posterior limb. All the joints become flexed abnormally, and the thigh bends backward. This condition may also be due to some disease of the spine.

The electrical current is very useful to determine how much certain muscles and nerves can be excited by the current and is particularly useful in the diagnosis of paralysis of the nerves and muscles and nutritive



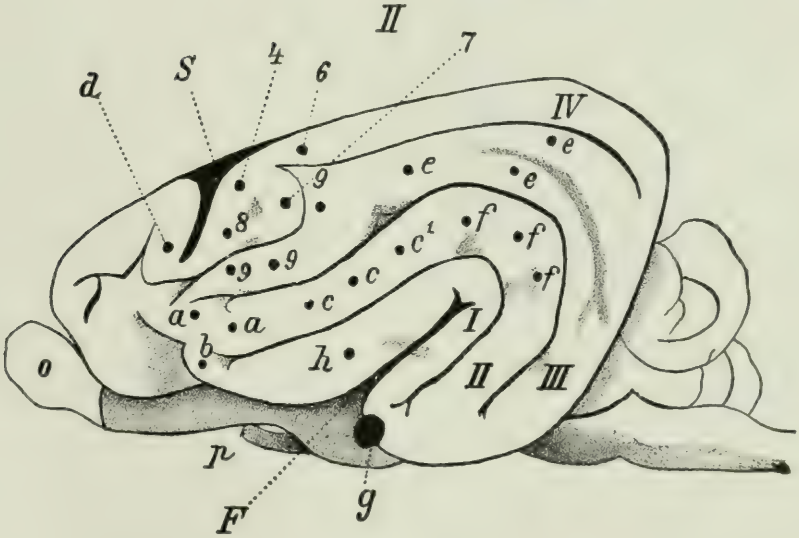


FIG. 125.—*I.*, shows superior portion of the cerebrum; *II.*, the lateral surface; and *I.*, *II.*, *III.*, *IV.* are the four convolutions; *S* is the sulcus cruciatus; *F*, the fissure of Sylvius; *o*. the bulbus olfactorius; *p* is the optic nerve. The motor centres are: 1, for the muscles of the neck; 2, for the extensors and adductors of the anterior limbs; 3, for the flexors and rotators of the anterior limb; 4, for the muscles of the posterior limbs; 5, for the facial muscles; 6, for the lateral movements of the tail; 7, for the retraction and adduction of the anterior limbs; 8, for the lifting of the shoulders and extension of the front limb (walking); 9, 9, for the orbicularis palpebrarum, zygomaticus, and closing of the eyelid; *I.*, *t*, the heat-centre of Eulenberg and Landois. (LANDOIS.)

FIG. 126.—*II.*, *a*, *a*, retraction and elevation of the corners of the mouth; *b*, opening of the mouth and movements of the tongue; *d*, the opening of the eyelids.

disturbances of the same. The faradic or the open circuit can be used. One electrode is placed on the body, generally along the spine and the other is placed on the muscle to be stimulated. The first electrode, that is placed along the spine should be of large size and the other that is to be placed on any particular nerve of muscle, must be comparatively

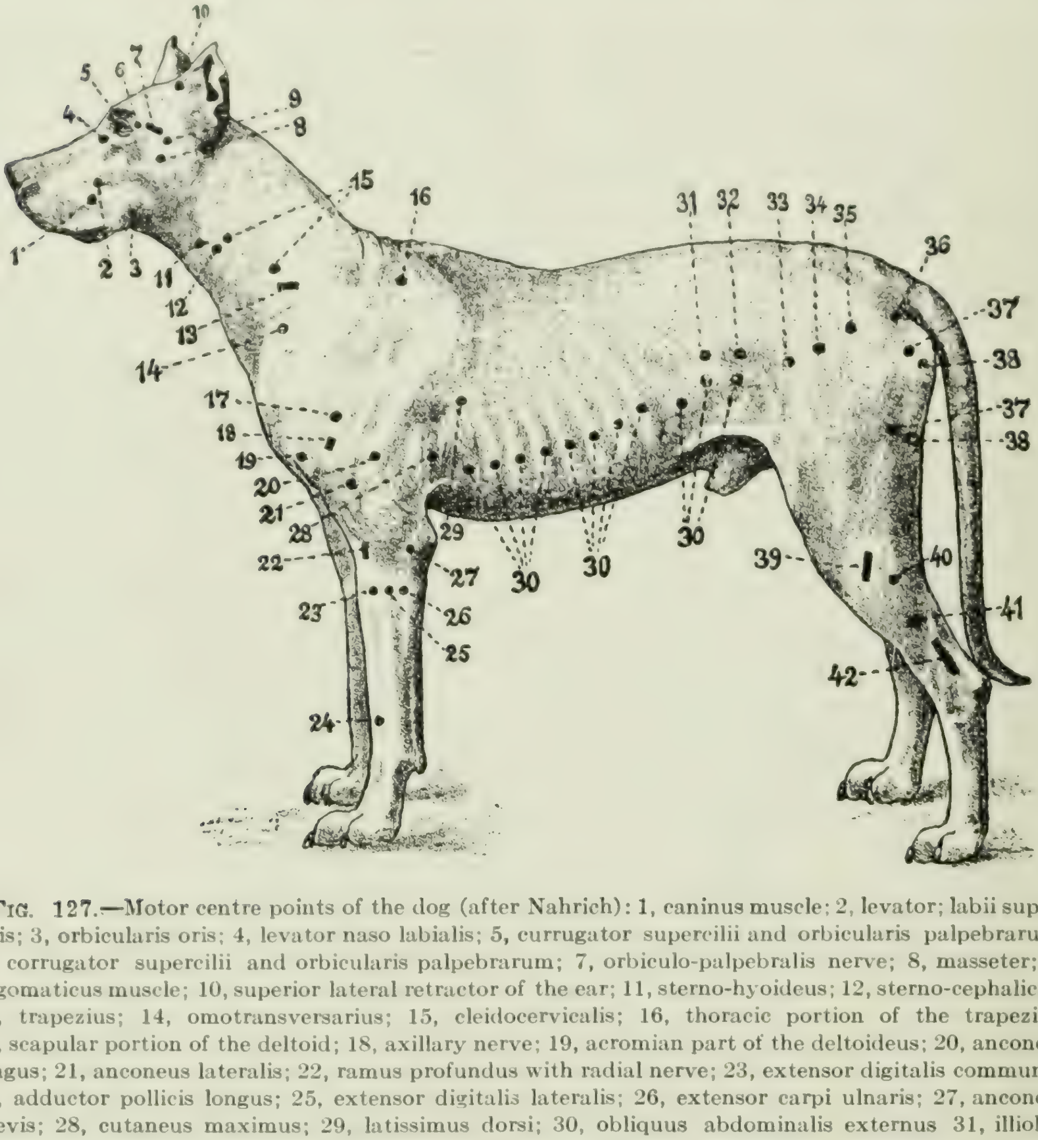


FIG. 127.—Motor centre points of the dog (after Nahrich): 1, caninus muscle; 2, levator; labii superioris; 3, orbicularis oris; 4, levator naso labialis; 5, currugator supercilii and orbicularis palpebrarum; 6, corrugator supercilii and orbicularis palpebrarum; 7, orbiculo-palpebralis nerve; 8, masseter; 9, zygomaticus muscle; 10, superior lateral retractor of the ear; 11, sterno-hyoideus; 12, sterno-cephalicus; 13, trapezius; 14, omotransversarius; 15, cleidocervicalis; 16, thoracic portion of the trapezius; 17, scapular portion of the deltoid; 18, axillary nerve; 19, acromian part of the deltoideus; 20, anconeus longus; 21, anconeus lateralis; 22, ramus profundus with radial nerve; 23, extensor digitalis communis; 24, adductor pollicis longus; 25, extensor digitalis lateralis; 26, extensor carpi ulnaris; 27, anconeus brevis; 28, cutaneus maximus; 29, latissimus dorsi; 30, obliquus abdominalis externus 31, illiohypogastric nerve; 32, illioinguinalis; 33, sartorius; 34, tensor fascia lata; 35, gluteus medius 36, gluteus superficialis; 37, biceps femoris; 38, semitendinosus; 39 peroneus nerve; 40, extensor digitalis lateralis; 41, peroneus brevis, 42, tibial nerve.

small so as not to cover more than the part to be stimulated. The electrode must be covered with linen or woolen cloth and moistened with a weak solution of common salt. The reflex movements are prompter when the electrode is placed on the so-called motive points which (Fig. 127) will give some idea of their location.

When a muscle is in normal condition it will answer promptly, when the electrode is put on it, by a quick quiver. In a degenerated or atrophied muscle, the reaction is a slow vermicular quiver or in old cases where the paralysis has existed for a long time there may be no motion at all. The constant or open current will frequently stimulate muscular contraction, when the faradic current will give no movements whatever. When degenerative muscular atrophy has set in for any length of time no reaction can be obtained from either current. For further details see special work on this subject.

The most important test of paralyzed muscles is their size. In all cases of prolonged paralysis the muscles atrophy quickly. The muscle gradually becomes smaller and smaller until it resembles a cord or tendon. In cerebral paralysis this does not occur, while in spinal paralysis it is always present. Of course, in some instances an inactive muscle will atrophy without any actual disease being present. The amount of atrophy which may occur in certain cases is indicated by a communication given to the author by Goubaux. In this instance the paralyzed anterior limb of a dog weighed 103 grammes, while the perfect limb weighed 148 grammes.

Convulsions.—Convulsion of the controlling muscles is the very opposite of paralysis. Convulsions are diseased contractions of the muscles which are independent of the will. There are several varieties of them. Clonic convulsions are short muscular contractions that occur at intervals, and between the intervals the affected portion of the body quivers constantly. Tonic convulsions are muscular contractions in which the muscle remains constantly contracted. It may occur for a minute or two, or may last several days. Tonic clonic convulsions are the medium form of the two conditions before described. A mild form of clonic contractions is noticed in the original muscular twitchings. Trembling and shaking convulsions, seen in chill, fear, or sudden cooling after being very warm, epileptiform convulsions, or eclamptic convulsions, are seen and extend over the whole body. In very rare instances they may be restricted to one portion, such as the head or neck. These generally come on suddenly and disappear in a few minutes. They are generally seen in the early stages of distemper, in teething, in irritated conditions of the bowels, or from noxious and poisonous food and from parasites; in cases of pentastomum in the nasal cavities, in encephalitis, meningitis, or uremia, and occasionally in acute anæmia; they also occur from some injury or irritation of the peripheric centres, and are very prominent in epilepsy. Rhythmic twitchings are seen in some muscular regions where the affected part of the body makes regular motions; for instance, in the muscles of mastication, in the muscles of the chest during sleep, and also in the twitching of certain limbs. They are very often mistaken for chorea, and appear as a result of distemper or some disease of the brain. They may also occur from disorder of the spine. These so-called cataleptic attacks consist of a rigid and contracted condition of all the muscles of the body, but are subject to passive movements. Nothing is known concerning their etiology. Tetanic convulsions are tonic convulsions of the whole muscular system of the body, They appear in tetanus and in some cases of poisoning (strychnine. brucine, caffeine, etc.). A variety of these tetanic convulsions is sometimes observed in the so-called cases of eclampsia in bitches who are nursing a large litter of puppies. Forced irregular actions of the body, such as walking backward or in a circle, or the animal rotating on its own axis, are seen as a rule in diseases of the cerebellum and in some

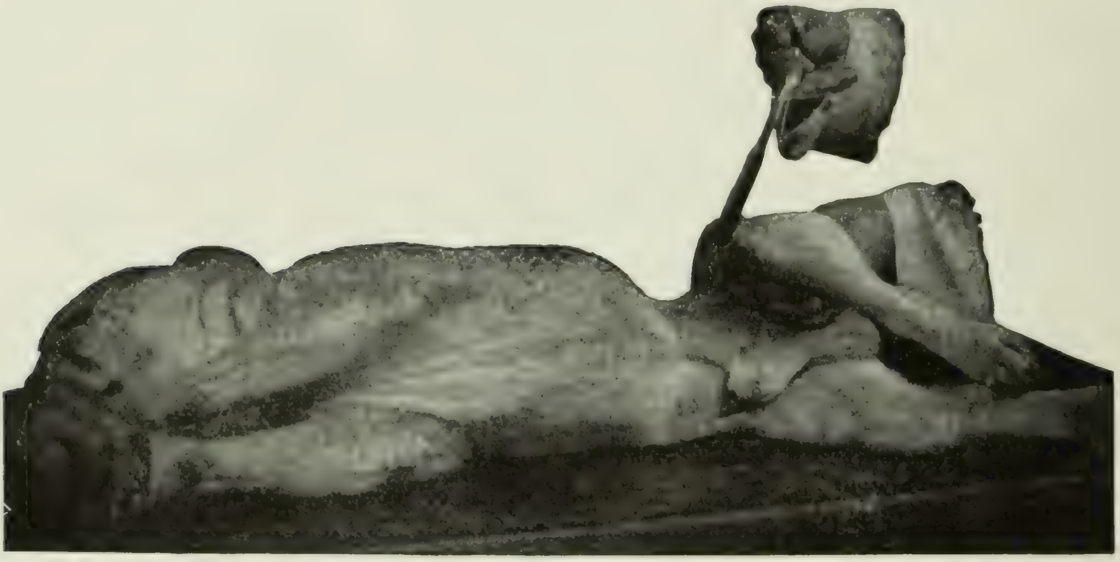


FIG. 128.—Testing the patellarreflex. (*Marek.*)

cases of poisoning (cocaine). (Santonin, male fern.) **In rare instances we see, in the above mentioned, symptoms of "epileptiform attacks." which we will refer to further on.**

Ataxia is due to disturbance of motility or an interference in the coordination of muscular action. Animals are unsteady on their legs, stagger from one side to another, and their action in walking is irregular. Ataxia is undoubtedly found in some diseases of the cerebellum, and may also be seen in disease of the pons and the fore ventricles, and, in very rare instances, of the spinal cord. Ataxia occurs very often as a result of distemper, and it occurs without any previous brain or spinal symptoms.

Concerning disturbances of vision, hearing and the action of the sphincters, they will be described under their special chapters.

Disturbance of Reflex Irritability.—Reflex action is those movements that are caused by some stimulus or irritation that produce a movement that is entirely independent of the will, unless the will is concentrated to oppose the movement. In this instance we call particular attention to what is known as patellar reflex. The animal is laid on his side with the hind leg to be examined on the upper side, the leg is slightly flexed and with the index finger or a percussion hammer a quick blow is made on the patellar ligament below the patella; under normal circumstances the quadriceps femoris muscle makes a quick contraction, the muscles of the leg contract and the leg is sprung forwards. The same reflex but to a lesser extent is also seen at the anterior face of the carpal articulation, the Achilles tendon, skin of the sole of the foot and the abdominal wall. An increase of the reflex is seen in the course of chronic diseases of the brain, in myelitis transversalis, spinal paralysis (first observed by Dexter) poisoning with strychnia, tetanus. A diminution of the reflex is sometimes found in acute diseases of the brain, which have been very rapid in their development, in certain diseases of the spinal substance, in disease of the peripheric nerves (in which case it is confined to the territory of the corresponding nerve) and in coma. The brain reflexes to be particularly considered are the conjunctival and corneal reflex seen by the closure of the eyelids on touching the conjunctival bulbi or the cornea and the pupil with its contraction or dilatation on the impression of light.

Pupillary reflex, i. e., contraction of the pupil under the influence of light, is absent not only in diseases of the retina and the optic nerve but in mydriasis in the course of meningitis cerebralis, encephalitis in the region of the oculo-motor ganglion, commotio cerebri, and under the influence of certain toxic substances (atropin group, cocain). One should remember, however, that psychic disturbances like alarm, fear and anger or anything that will attract close attention may cause temporary dilation of the pupils. This also occurs when looking at near objects. Myosis, i. e., contraction of the pupils, is observed primarily in intoxications with physostigmin, pilocarpin, arecolin, morphin, carbon monoxid, meningitis and injuries to the skull. In the latter conditions there may also be mydriasis or the reaction may be variable. A synechia may cause the pupil to become fixed.

DISEASES OF THE BRAIN AND ITS COVERINGS.

Hyperæmia of the Brain.

Etiology.—There is an active and passive hyperæmia. Active hyperæmia of the brain is caused by an increase of the circulation as the result of increased heart-action. This occurs in hypertrophy of the left ventricle, from excitement, in young animals, from heat (sunstroke), in great bodily exertion, in teething, high temperture; blows, nervous temperament, from overeating, the effects of certain narcotics, and as a secondary symptom of certain diseases.

Passive hyperæmia (stagnation) occurs in compression of the jugular veins by tumors, such as large goitres, by obstructed respiration, from tight collars, in acute bronchitis, and in compressed conditions of the lung due to hydrothorax, extended indurations of the lungs, defects in the venous openings of the heart. Hyperæmia of the brain accompanies various acute internal diseases, and as a secondary symptom of a large number of disorders; it is also seen as a result of various poisons, such as alcohol, certain narcotics, etc.

Pathological Anatomy.—As a rule, hyperæmia of the brain occurs in connection with congestion of the coverings of the brain, especially the pia mater. When hyperæmia is very intense, or where it has existed for a long time, we cannot definitely separate the conditions. We find the dura mater distended, but very little changed. The vessels of the pia mater are much injected, the torsions of the vessels are flattened, and the sulci are perfectly flat as if pressed out of shape. We find the gray matter is darker than usual, while the white brain substance is dull gray or yellowish red, and presents numerous bloody spots which may be easily removed. In chronic conditions of this disease, we find venous hyperæmia. The brain appears in such cases pale and anæmic, very moist and soft, and on section has a brilliant, mirror-like lustre. It is lessened in size and doughy in consistence and the subarachnoidal fluid is increased.

Clinical Symptoms.—The symptoms of active hyperæmia of the brain are characterized by a sudden development of excitable symptoms. These consist in great restlessness, running around, making frequent changes of position, irritability, a tendency to biting and attacks of delirium, partial or general convulsions, and an increased activity of the action of the heart. The pulse is quick and irregular; the respirations are short. There is congestion of the mucous membranes of the head, and the upper portion of the head is warm to the touch. There is contraction of the pupils and sometimes vomiting. These symptoms of excitement rarely last very long, and generally disappear quickly; although in rare instances, they may last some time without leaving any trace on the general system. They may, however, alternate with periods of apparent rest to recur again in a short time. The writer has observed this in cases of apoplexy of the brain. In this condition there is dulness, unsteady gait and if there is entire stupor, stertorous respiration is apt to be present with this last symptom. It is doubtful in such cases, if we have to deal with actual hyperæmia; more likely, a more of less serious alteration in the brain.

Therapeutics.—The patients should be kept in a cool quiet place, in subdued light if possible. They should be kept as quiet as possible. Congestion of the brain should be counteracted by means of cold compresses (ice bags), Priessnitz bandages for the shoulder and trunk and enemas of soap and water, or common salt solution. Infusions of cold water into the colon frequently have good effect while bleeding as a rule is contra-indicated on account of the debilitated condition of most patients. Mild purgatives, Glauber and Epsom salts, castor oil and electuaries of senna may be considered for internal treatment. If the animals are excited sedatives are indicated—morphin, chloral hydrate, potassium bromide, sulfanol, etc. When there is depression, alcohol and coffee are indicated. Wherever possible the causes should be considered and removed. Conditions that predispose to cerebral congestion, teething period for example, also sunstroke and overheating, should be taken into consideration and guarded against where possible.

Anæmia of the Brain.

Etiology.—The most common cause of anæmia of the brain, is impoverished blood, acute hemorrhage, prolonged debilitating disease, or from some obstruction of the arterial system, such as tumors, hemorrhages, or inflammatory exudations within the skull; also compression of the carotid arteries by emphysema, and in some instances from contraction of the small arteries of the brain, caused by excitement. Chronic anæmia of the brain may be caused by the presence of intercranial tumors, or hemorrhage, chronic hydrocephalus pachymeningitis.

Pathological Anatomy.—The white substance in rare instances has a few bloody points. As a rule, however, the brain appears on section dull white, the gray matter being unusually bright, without any trace of coloration. The meninges and coverings of the brain may possess their normal quantity of blood, even in intense anæmia.

Clinical Symptoms.—Acute anæmia, especially when it has been caused by hemorrhages, is indicated by a small, weak pulse, dilatation of the pupils and a coldness of the extremities, with attacks of dizziness, and loss of conciousness. Convulsions are rarely present in chronic anæmia of the brain, and very often stupidity, quivering of the muscles, great fatigue on the slightest exertion, loss of appetite, and a tendency to vomiting is noticed, and even general convulsions.

Therapeutics. The treatment of acute anemia calls for active cutaneous stimulants like wine, brandy, ether, black coffee, camphor, atropin, scopolamin, inhalation of ammonia vapors or tincture of mustard. Artificial respiration and stimulation of the phrenic nerve by the faradic battery may be indicated, and necessary. If much loss of blood has occurred intravenous injections of physiological salt solution or copious injections of water per rectum should be resorted to. Treatment of the chronic form should be in accordance with the requirements of the basic ailment and general anemia (see anemia).

Cerebral Hemorrhage.

(*Apoplexia Sanguinæ*; *Hemorrhagica Cerebri.*)

Etiology.—The chief cause of cerebral hemorrhage is an increased pressure on the vessels containing the blood, and where the walls of these vessels present some abnormal condition by which they are debilitated or weakened. This condition of the walls of the vessels may be caused by atheromatous degeneration, or by some disturbances in the nutritive process of those parts, as in serious diseases of an infectious nature, such as distemper, leukæmia, and also in certain forms of poisoning. Great exertion, intense psychic agitation (mental excitement), or great heat may also produce this condition.

Pathological Anatomy.—Hemorrhages appear, as a rule, on the cerebrum, and occur from a capillary hemorrhage and are indicated by a slight red coloration which cannot be wiped off; but in the most serious forms you may find a distinct number of spots which become confluent. In some cases there is a considerable bloody discharge, indicating the breaking down of some large blood-vessel. If the blood-vessel is located in the hemisphere near the surface, the dura mater appears distended at the affected location; the convolutions of the brain are flattened and the furrows depressed. The substance of the brain is always more or less destroyed, and, if the animal does not die quickly, the discharged blood lying in the tissues forms clots very rapidly. Its fluid parts become absorbed, fibrinous substances are formed, and the blood-corpuscles destroyed, being altered into a chocolate-colored emulsion which finally becomes absorbed. The coloring matter of the blood remains on the brain as a rose-colored pigmentation. The centre becomes smaller and smaller, until the development of numerous connective-tissue adhesions unite it to the wall, or an apoplectic cyst is formed, which has a smooth inner wall filled with serum. This cyst takes the shape of the surrounding tissues.

Clinical Symptoms.—Capillary hemorrhage appears occasionally in some of the grave infectious diseases, and may cause little or no disturbance of the general system that can be recognized during life, or there may be slight manifestations of the condition, such as dizziness, partial loss of consciousness, staggering or giddiness, and in some cases, vomiting; these however, are only temporary. In extensive hemorrhage, on the contrary, there is the sudden appearance of grave cerebral symptoms. The animal falls down without any premonitory symptoms, or else shows, for a short time, dizziness, staggering, trembling and uncontrollable movements, or convulsions, and then loses entire consciousness. The pulse becomes weak or irregular, or rapid and very small. The respirations are deep, stertorous, and irregular. The mucous membranes of the head are intensely reddened, and in the early stages of the attack, convulsions are very frequently noticed and involuntary evacuation of urine and fæces. This is followed by partial or complete paralysis, which is due partially to destruction of the brain substance, and partially to the blood pressing on the brain. This paralysis may affect the extremities, both anterior and posterior, that half of the body which is opposite to the extravasation in the brain being the one affected. The animal may also become blind. This disease may result: 1, in death, which occurs either in a few moments or may take days; 2, in complete recovery—this however, only occurs where there is a small hemorrhage, and in one of the centers of the hemispheres; 3, in complete recovery, with partial or complete paralysis, according to the amount of hemorrhage.

Great hemorrhages of the cerebral membranes are marked by the same symptoms as apoplexy of the brain. **Apoplexia meningia,** occurs generally in connection with violent traumatisms of the skull, such as shocks, concussions, fractures, etc. The blood is generally found in the cerebral membrane, between the dura mater and the skull. It may also be observed in the subarachnoidal chamber and in the brain-cavities. The symptoms are similar to those of apoplexy of the brain, but, as a rule, convulsions appear earlier, and the animal, while he may present symptoms of coma, makes a much quicker recovery.

Therapeutics.—Absolute rest, cold compresses on the head, stimulants when the pulse is weak, ether and camphor, either internally or subcutaneously, after the coma disappears, purgatives and injections of soapy water per rectum to stimulate evacuations of the bowels. To relieve congestion of blood vessels, administer iodide of potassium.

Traumatic Lesion and Concussion of the Brain.

Concussion and Commotis Cerebri.

Etiology and Pathological Anatomy.—The cause of this condition is some traumatism to the skull bones, such as butting the head against a wall when running fast, being hit with a stone or quoit, or struck with some vehicle, or falling on the head out of a window. Some portion of the skull is depressed, cracked or splintered, pressing on the brain substance, and causing more or less extensive hemorrhage of the interior of the cavity of the brain. The hemorrhage is generally most extensive in the dura mater, between it and the cranium, but it may also be observed between the pia mater and the cerebral cortex or even in the brain substance itself, and while under the microscope we may not find any change in the brain substance in spite of the fact that there is grave cerebral disturbance, it has been called concussion of the brain and is due to a mechanical displacement of the brain substance and the fluids of the brain are compressed in the ventricles.

Clinical Symptoms and Therapy.—Any pronounced traumatism of this kind generally causes death. There may be bleeding from the nose or ears, with acute congestion of the conjunctiva. Give the animal absolute rest, cold local applications, surgical treatment of the injured portion of the skull, and also the injured soft tissues, evacuation of the fæces and the administration of stimulants.

Inflammation of the Brain.

From a pathological standpoint we have to make a distinction between inflammation of the hard cerebral substance (pachymeningitis) and that of the soft cerebral membrane (leptomeningitis). This classification, however, need not be used in a clinical way, because in the dog, the described forms run their course with the same symptoms.

Etiology.—Inflammation of the brain may be the result of some traumatism, or from sunstroke, great physical excitement, over-exertion, etc. This condition also occurs secondarily from disease, such as distemper and pyæmia, causing suppuration within the skull, in inflammation of the frontal cavities as a result of the irritation caused by the presence of parasites; in purulent inflammation of the ear (in connection with external otitis), and from abscess of the middle ear and orbital cavity. Inflammation of the brain is seen in certain infectious diseases, especially distemper, and is also associated in rare instances with pharyngitis, bronchitis, gastritis, and also from unknown causes. In dogs that died from inflammation of the brain, Trolldenier found a pathogenic streptothrix, allied to the group of actinomycetes. Over-exertion and great physical excitement are also said to be predisposing causes of this disease.

Pathological Anatomy. 1. Inflammation of the Dura Mater. Pachymeningitis.—The dura mater is covered with a number of small hemorrhages. It is loose, easy to tear, and over the surface is a collection of bloody, purulent masses of exudation. In the later stages of the disease we see a circumscribed or extended thickening and adhesion of the covering to the base of the skull or to the soft cerebral-membrane.

2. **Inflammation of the soft Cerebral Membrane. Leptomeningitis.**—The arachnoid is loosened and dull. The subarachnoid chambers are filled with more or less turbid fluid. The pia mater is hyperæmic, loosened, and covered by fibrinous exudation. The coverings of the brain are almost always infiltrated and detached from the pia mater with difficulty and in some cases we find a serous or purulent fluid in the ventricles. In a chronic case we find a circumscribed thickening of the cerebral membranes and adhesions uniting the coverings with the brain, etc.

3. **Inflammation of the Brain Mass. Encephalitis.**—This disease, as a rule, involves single centres and causes a general irritation of the healthy tissue without any distinctly marked limit. In the affected regions the substance of the brain is swollen, hyperæmic, and frequently filled with small hemorrhagic centres. In the course of time, the inflamed cerebral substance becomes softened and pulpy. This condition may be present without any hemorrhage, but as a rule, the brain matter becomes red and finally yellowish. This latter color is due to metamorphosis of the coloring substance of the blood or to fatty degeneration. These conditions are divided into white, red, or yellow—softening of the brain. Finally cicatrices and cysts are formed, as in apoplexy, or an abscess may be developed which is filled with thick yellow or greenish pus, which later becomes encysted and sometimes solidified (calcareous). In some cases small encephalitic centres may heal without leaving any trace. Occasionally we see the development of a (non-inflammatory) softening of the brain with thrombosis and embolus of the arteries; and, as a general rule, we find symptoms which resemble apoplexy.

Clinical Symptoms.—The symptoms of inflammation of the brain in its early stages resemble those of hyperæmia. The animals are excited; they run aimlessly from one side to the other, and are fretful and irritable. They whine and howl constantly. The head is hot; the conjunctiva is more or less reddened, the pupils are contracted, and reflex action is very slight. The appetite is lost; constipation is generally present, with more or less vomiting. The patient is indifferent to the impressions of external objects, being sleepy and apathetic. Soon the disease changes in character. We see acute convulsions, especially those of the jaw, or eclamptic convulsions. The animals cry and howl. At the same time the sphincters are relaxed, the animal apparently having no control of them. Then there is an interval of quietness, in which the animal falls back into a deep semicomatose condition, and between these periods of quietness, we very often see automatic movements, such as quivering or twitching of one or two of the legs; also the corners of the mouth may be retracted. Many cases either howl constantly, and at the same time seem to be semicomatose, or they may bark hoarsely (delirium). As a rule, the temperature is a little above normal. Within a short time the animal becomes gradually paralyzed, losing all power of the muscles. The patient is dull and unconscious of external influences. The breathing is rattling and stertorous. The pulse is increased a number of beats, but is almost imperceptible to the touch. The temperture now begins to rise. In some cases the temperature may remain normal, and in rare instances falls below normal. As a rule, the animals die shortly after the convulsions make their appearance. Complete recovery is very rare, and slight attacks terminate as a rule either with paralysis (partial or complete), idiotism, or blindness.

The course of this disease varies greatly in affections of the cerebellum. If the hemispheres are affected, we may have extensive alterations of the brain, which may run their course without any decided symptoms being shown; but as soon as the cerebellum and one or both hemispheres become affected, we then see the various symptoms peculiar to this disease, and a diagnosis can be made with almost absolute certainty. In disease of the cerebellum there is generally an unsteadiness of the gait in walking and peculiar movements, such as walking around in a circle and rolling on the ground, when both hemispheres are involved. We may also find paralysis of the posterior extremities. In rare instances, however, these symptoms may also be presented in cases of poisoning (by cocaine or apomorphia).

The differential diagnosis between inflammation of the brain, congestion of the brain and rabies is taken up under another head.

Very similar symptoms to those already described appear in cases where the cysticercus cellulosæ is present in the brain or its membranes.

Therapeutics.—The treatment of inflammation of the brain corresponds with that of hyperæmia of the brain. Rest, confinement in a dark, but not warm, room, cold applications to the head, clysters, laxatives, especially calomel and in cases of great excitement, sedatives (morphia sulphas 0.02 subcutaneously, chloral hydrate 2.0 to 4.0, by the mouth, or per rectum, in the form of clysters). Potassium bromide, sulfonal, and other sedatives may also give good results unless the case is hopeless in the beginning. The violent irritants which were formerly used on the skin, such as croton oil or cantharidal ointments rubbed on the inner fascia of the thighs and along the spine, are of no particular benefit, in fact do more harm than good. Food should be light, and easily digested, such as soup, broth, etc., and to assist in the reabsorption of the exudate, iodide of potassium may be administered internally. In cases where depression, somnolency or sopor persist, excitants like ether, camphor, alcohol, caffein and scopolamin may be tried. The use of pilocarpin injections as recommended for horses, to reduce cerebral congestion is useless and even dangerous for dogs.

Comparatively Rare Diseases of the Brain.

The following diseases of the brain are rarely seen, but a description may be useful to the practitioner.

Chronic Hydrocephalus.—This condition is similar to what is known as a "dummy" in the horse, and it may be congenital or it may follow distemper. Frohner found twenty-nine cases in 70,000 dogs. The following symptoms are observed: dulness, head inclined to one side, uncertain, irregular gait, with a tendency to go to one side, amaurosis, deafness, and loss of the sense of smell. On post mortem, the brain on section is found to have a sero-lepto-meningitis, with large collections of fluid in the ventricles; in some cases only a pachymeningitis has been observed. The treatment consists in giving laxatives. Injections of pilocarpin, as a rule, only produce a slight amelioration of the symptoms.

Sunstroke.—This is very rare, but it is occasionally seen in the working dogs of European countries, where on extremely warm days the animals pull very heavy loads. In cases where the animals die, we find the same phenomena observed in congestion or inflammation of the brain. In one case the entire muscular system was filled with small hemorrhagic centres, much hyperæmia, and a considerable quantity of sero-sanguinous fluid. Between the dura mater and the arachnoid the surface of the brain was covered with small hemorrhages, the lungs were congested, the heart dilated and flabby, and full of dark coagulated blood. Occasionally an animal may die without any premonitory symptoms, or may collapse suddenly, having a very strong throbbing pulse, dyspnœa, mouth open and tongue hanging out, and an increase of temperature.

Treatment.—This is similar to the treatment of congestion and inflammation of the brain; rest, cool room, cold compresses to the head and if there is great depression, stimulants may be administered.

Turning Disease.—This condition is indicated by the animal turning in circles. These movements are involuntary and are due to some morbid process of the brain particularly in the cerebellum, especially its peduncles, such as hemorrhage, inflammation, embolus, etc., and it may also result from blows, injuries to the skull, it may result from nervous distemper, or it may also be from some reflex action. Frohner observed it in constipation, and he also found this disease in twenty-nine animals in an observation covering 70,000. The treatment consists in keeping the animal perfectly quiet and the adminstration of sulphonal, hypnon and urethan.

Edema and Parasites of the Brain.—Edema is generally found on post mortem and is especially interesting, for as a rule there is not the slightest indication of this condition seen during life; in rare cases edema is found to be the cause of a variety of symptoms during life, such as monoplegia, hæmiplegia, hemianæsitasia, involuntary muscular movements, ataxia, convulsions, and from the increased pressure on the brain we may find stupidity, clumsiness, giddiness, and fainting spells.

Parasites produce certain brain phenomena and particularly from the presence of the cysticercus cellulosæ, such as great nervous excitement, attacking persons without cause, involuntary movements, great depression, coma and blindness, and frequently every sign of rabies is present.

Progressive Paralysis of the Medulla Oblongata.—This is called in man a progressive atrophy of the medulla oblongata. This condition presents partial paralysis of the tongue, of deglutition, of the larynx, of the lips. It is extremely doubtful if this condition does, *per se*, occur in the dog, it being due to some other condition being present in the brain. Hutyra and Marek have, however, seen a number of cases of acute paralysis of the medulla, particularly paralysis of deglutition and paralysis of the tongue (see further under that head).

Cerebro-spinal Meningitis (Meningitis Cerebro-spinalis). Etiology.—Nothing is definitely known of the causes of this disease. It is extremely rare in the dog. Renner and Kempen have made several observations on the subject, and the writer had one case of his own.

The anatomical foundation of the disease seems to be an acute suppurating inflammation of the brain and spinal membranes, a purulent exudation in the arachnoid, especially on the hemispheres and the base of the brain, which is infiltrated by a quantity of serous fluid. The same condition is also found in the spine.

The symptoms are disturbances of the sensory nerves, in some cases the animal becoming unconscious. There were loss of appetite, fever, and after a few days a marked unsteadiness of the gait, beginning with a slow, dragging walk, and difficulty of deglutition, becoming complicated with tonic convulsions which finally became epileptic, staggering gait, convulsive movements of the muscles of the neck, opisthotonos, and lastly stupor, coma, and death.

The treatment consists in the administration of sedatives such as chloral hydrate, sulphonal or hedonal.

DISEASES OF THE SPINAL CORD AND ITS MEMBRANES.

Inflammation of the Spinal Cord and Its Membranes.

(*Myelitis and Spinal Meningitis.*)

Etiology.—A common cause of myelitis and spinal meningitis is traumatisms of some kind causing direct injuries to the spine, such as violent blows, shocks to the vertebral column by falling out of a window, etc., and further by concussions of the spinal cord, such as being struck by an automobile or wagon. Violent muscular exertions frequently produce this condition. In very rare instances, the disease may follow the presence of an abscess on the outside of the spinal canal, by extension of the suppurating process through an orifice of the vertebra, and occasionally you see it originate, in connection with some infectious or toxic disease (distemper, rabies, pyæmia) due to the specific toxic material locating in the cord. It may also be caused by cold, being continually wet and frozen, as in retrievers.

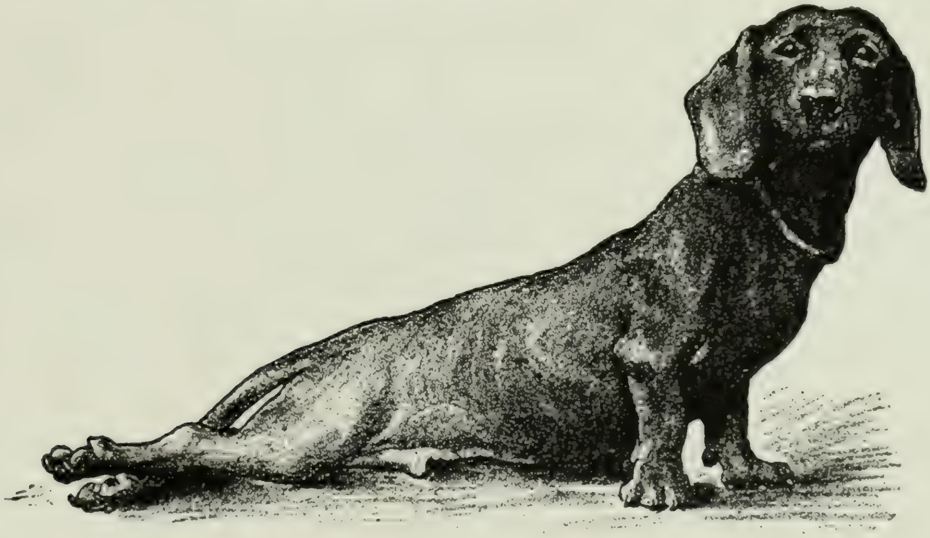


FIG. 129.—Paralysis of the posterior extremities.

Pathological Anatomy.—The inflamed pia mater appears thickened, infiltrated, and may be injected in some places and, as a rule, adherent to the vertebra, due to the organization of the exudation. It is covered on its upper surface by a serous, fibrinous, or purulent exudation. The arachnoid exudation is covered by a milky, false membrane and greatly thickened. The dura mater is rarely involved, but when such is the case it becomes thickened and loosened and covered with a thin serum. The spine itself shows the inflammatory process either extended over large surfaces or else confined to small centres. In the early part of the disease, the cord is slightly swollen; the gray substance is somewhat reddened, dark and soft. Later the cord becomes a yellowish-red, breaks down and undergoes white, yellow, or red degeneration. In the chronic course of the disease we see atrophy of the nerves as a consequence of malformations of the connective tissue.

Clinical Symptoms.—As a rule the symptoms of alteration of the spinal cord appear gradually and become more intense as the disease progresses. Where the disease is due to violent traumatisms, producing a direct destruction or laceration of the nervous centres, or pressure, caused by hemorrhage and blood being discharged and pressing upon the spine the symptoms are immediately seen or appear in a very short time. In all diseases of the spinal cord it is very important to recognize the fact that consciousness is rarely affected. We will take up all these symptoms in the following description, which may be observed in affections of the spinal cord:

Motor symptoms of paralysis are, as a rule, the first symptoms presented. The patients have a dull heavy look, staggering gait, but not irregular (in this the condition differs from disease of the cerebellum). Finally, they begin to drag their hind legs after them (Fig. 94), the posterior extremities are invariably the parts paralyzed. When they are placed on their legs they stand with them spread apart, or they may simply drop sideways on their hind quarters. In rarer cases, not only the posterior extremities but also the anterior are paralyzed, and it is evident that in cases of paralysis of all the members the spinal substance of the cervical region must be affected, while paralysis of the posterior extremities follows, no matter what part of the cord is affected. In these cases we always have the double-sided paralysis, and in very rare cases the paralysis may be more intense on one side than the other; but in such a case we can only suppose that in one-half of the spinal cord the disease is more advanced than in the other.

In the early stages of the disease there are slight, irregular twitchings of the extremities, rarely of any great consequence, and seldom leading to convulsions. There may be marked hyperæsthesia and the animal gnawing continually at certain points of the body, muscular twitchings, drawing in of the hind legs toward the abdomen. There may also be a continual erection of the penis, and the evacuation of the urine and fæces may be interfered with on account of the convulsive contraction of the sphincter or paralysis of the detrusor urinæ and muscles of the intestine. We also observe disturbances of sensitiveness either in the form of hyperæsthesia or of anæsthesia. The former is invariably observed in the early stages of the disease; the patients show intense pain, especially when touched, lifted, or pressed upon the spinal cord. (This they indicate by biting, howling, etc.) In the latter case they do not show the slightest reaction in the affected regions, even when subjected to serious irritations of the skin. It must be remembered, however, that symptoms similar to hyperæsthesia may also be present in rheumatism.

In mild stages of this disease the sphincters, such as the bladder and rectum, appear slightly affected. In the more serious stage we observe complete paralysis, loss of control of the sphincters, and frequently complete paralysis of the sphincter vesicæ. More details will be found on this subject under Diseases of the Bladder. Such paralytic conditions of the bladder may occur in all diseases of the spine. There is difficulty in the passage of fæcal matter, producing constipation, caused to a certain extent by the loss of abdominal pressure. Paralysis of the sphincter is evinced by a gaping rectum and the involuntary escape of fæcal matter which accumulates in the lower bowel. Through want of active exercise, the muscular system of paralyzed animals, especially the extremities, becomes flabby, soft and atrophied. The temperature is reduced in the paralyzed portion, the extremities being cold and anæmic. In cases where there is paralysis of the spinal cord caused by compression, and in cases of atrophy due to hemorrhage on the spinal cord, and also in certain luxations or fractures of the vertebræ, we practically see the same symptoms. Paralysis of the extremities, particularly the posterior, may result from the following conditions:

a. Paralysis of the spinal cord caused by compression may result from thickening of the membranes and pressure on the spine itself. It may also occur in some diseases of the vertebræ, for instance in exostosis, but both of these conditions are very rare. In such cases the symptoms come on very slowly and gradually increase in intensity.

d. Apoplexy may occur, due to the presence of some blood escaping on the spine and causing pressure. In these cases the paralysis appears very suddenly, but may gradually disappear after some time.

c. Luxations of the spinal column only happen in the vertebra of the neck, and cause a peculiar oblique position of the head, as if it were twisted to one side. This is due to displacement of the ligaments. At the same time there is present a series of what might be called "special symptoms," which are not very pronounced in any of their characters.

b. Fractures of the spine: These are generally recognized by some change in the position of the region in which they are located (bending inward, flattened depressions, and in rare instances slight distortions of the spinal cord), and also by the extensive sensitiveness to pressure in this location. In certain instances there may be an abnormal mobility of the part. Crepitation, as a rule, is absent. In fractures of the cervical vertebræ, we generally notice an oblique position of the head. If the symptoms just described are absent, when an animal has had a severe fall on the spine, unless paralyzed, or remains without loss of consciousness, it is always doubtful if there is a fracture of the vertebræ or a hemorrhage within the vertebral canal. In such cases we simply have to await developments, or if paralysis does not immediately follow the injury, but comes some time afterward, it is due to compression of the spine from a gradually increasing hemorrhage. We must remember, however, that a fall, shock, or blow upon the back, or ordinary irritations of the spinal substance may occur, like a concussion of the brain, in which there is not the slightest alteration to be found in the spinal substance or its membranes. In many cases we may expect a recovery as long as there are no myelitic complications.

Chronic Inflammation of the Spinal Cord.—This condition follows as a sequence to the acute form or it commences at the onset as a gradual progressive affection. It has been contended that overstimulation of the sexual organs is an exciting cause, but this is not admitted by all observers. Chronic inflammation of the cord is indicated by disturbances of mobility, the animal is easily tired on very slight exertion, shows a want of coordination in walking, great difficulty in rising after lying down for some time, regular or irregular twitching of the muscles in the affected extremities, or complete paralysis of the hind quarters and in very rare instances of the anterior limbs, more or less disturbance of the sphincters, and gradual atrophy of the affected muscles. The appetite is invariably good and there is no rise of temperature.

Pachymeningitis spinalis ossificans, that peculiar disease indicated by a gradual ossification of the spinal membranes, is not at all uncommon in dogs of an advanced age. This disease consists of a gradual inflammatory process of the dura mater, in which that tissue gradually becomes filled with numerous irregular or massed collections of tolerably firm bony scales, situated on the ventral surface of the tissue, particularly in the region of the cervical and lumbar regions of the cord. The whole dura mater may become converted into a hard bony tube, and in exertion of the body the roots of the nerves may be torn from the spine.

The ossific hardening of the dura may be present for a long time before any actual clinical symptoms are present (Cadéac) and are generally produced by laceration of the sensory nerve fibres, by violent or unusual movements, or movements in a certain direction of the spine. The voluntary movements of the animal are cautious, stiff, or stilty, either on walking about, lying down, getting up or climbing up stairs; the latter he may refuse to do, and on forcibly bending the spinal column the animal may evince pain. The back is turned or crooked to one side, the hind legs being carried forward under the abdomen (Fig. 130). Frequently the animal may cry out, howl or show great pain on certain movements or positions of the body, the same movement apparently he may have done a few moments before without showing the slightest pain. This condition is frequently mistaken for acute muscular rheumatism. In rare cases the animal carries the hind quarters in the air and balances the body on the anterior limbs (Fig. 131), and gradually there is a great increase in the muscular development of pectoral and thoracic muscles; as a rule there is a tendency to retention of the fæces and urine, but there may also be involuntary passage of urine and fæces. The appetite is generally impaired, the reflexes are impaired and the penis may either be erected or protruded beyond the prepuce. The disease may vary to a certain extent in intensity, but sooner or later the paralysis increases, either involving one leg more than another or the entire hind quarters are affected; gradually the sensibility decreases and the animals show entire loss of muscular power and pain in the affected parts.

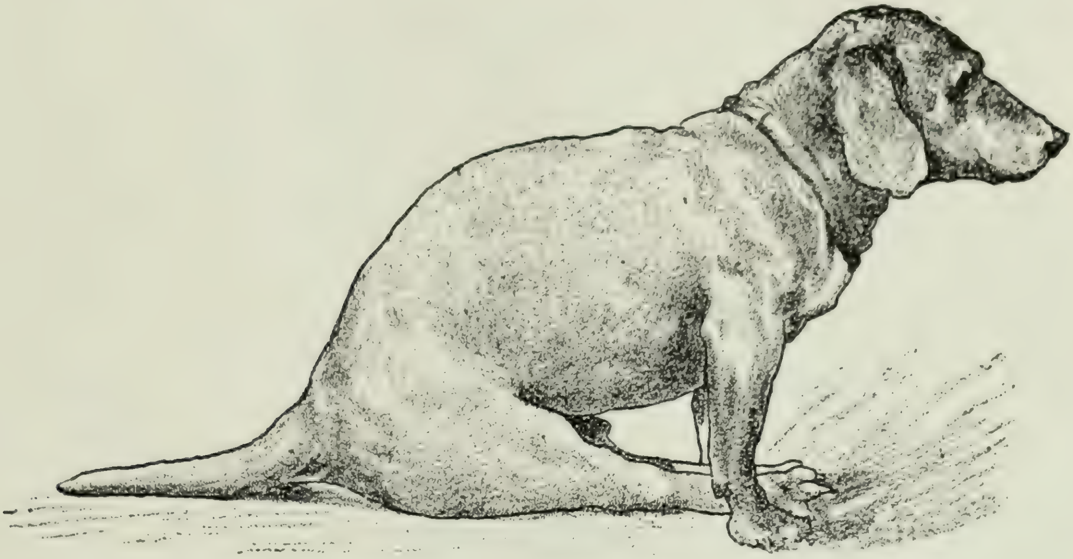


FIG. 130.—Paralysis of the cord.

Therapeutic Treatment of the Diseases of the Spinal Cord.—In the early stages of the disease when fever, hyperæsthesia, and convulsions give pronounced evidence of the disease, it is advisable to give antiphlogistic treatment, consisting of cold compresses (ice bags) upon the spinal cord, and vigorous purgatives (calomel), saline purgatives, and lastly enemas. In cases where the paralytic symptoms predominate, we use irritants along the spinal column, such as painting with cantharidal, collodion, or dilute croton oil, viz., oleum crotonis 0.5, ol. terebinthin 15.0; this preparation is rubbed into the skin along the vertebral column by means of a woolen cloth; blistering with biniodide of mercury or the use of the actual cautery, in the form of pin-point firing along the spine. Sometimes in mild cases use an inunction of mustard oil. If great pain is present use morphine, chloral hydrate, or sulphonal. If we succeed in lessening the convulsions, or if the paralytic symptoms predominate, we must use stimulants such as strychnia and electricity. The first should be used internally in the form of tincture of nux vomica, from five to twelve drops, or subcutaneously in a strychnia solution; the latter method is better. We must remember that one daily injection is sufficient, and that a medical pause of from thirty-six to forty-eight hours ought to be made every four or five days in order to prevent the cumulative influence of this drug.

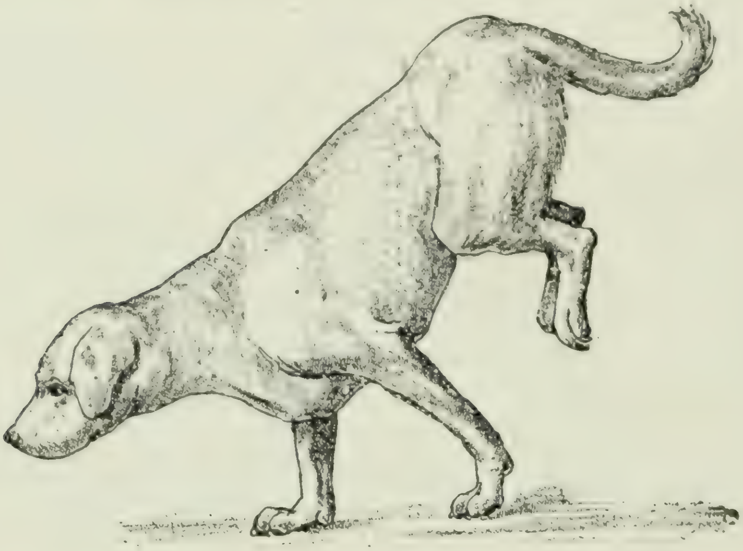


FIG. 131.—Dog with pachymeningitis ossificans. Characteristic position of the body in walking.

℞.	Strychnia muriate,	0.005
	Aqua,	5.0

Electricity is applied in the following method: after having previously dampened the region with a concentrated saline solution one pole of the battery is placed on the spine and the other at the termination of the paralyzed limb. For instance, one is put on the foot and the other in the middle or side of the spine, gradually increasing the current. In such cases, besides administering a purgative and cleansing the bowels, we must also see that the bladder is emptied by means of a catheter. Electricity is also a useful agent in peripheral paralysis, which has been mentioned. The faradic current is preferable. Place one of the poles as close as possible to the point of central location of the affected nerves and gently run over the paralyzed muscles with the other pole. This treatment should be renewed every day for ten or fifteen minutes. Alcoholic frictions, such as spirits of camphor, tincture of arnica, bay rum, opodeldoc liniment, are to be recommended when used in connection with true massage (pinching, friction, and massage of the paralyzed muscle in its proper direction). Warm baths are said to be useful. As a means to promote reabsorption, administer iodide of potassium 0.09 internally. Subcutaneous injections of eserine and pilocarpine, or pilocarpine alone may be used if it is suspected that a large amount of fluid exudate is on the cord. On account of the toxic properties of these drugs, great care must be used in their administration. The bladder must also be emptied by either pressure on the abdominal wall or by catheterization, and the rectum emptied by means of clysters and the food must be such as will digest easily.

In cases of ossific pachymeningitis, Cadéac and others recommend friction with strong liniments, actual cautery, or setons, along the spinal column as well as painting the spine with tincture of iodine, and also the internal administration of iodide of potassium, salicylate of soda, salol, salophen, antipyrin, etc. As a tonic strychnia should be used in combination with arsenic or quinine and lastly the galvanic current has produced good results in some cases.

℞. Strychnine muriate,	0.005
Aqua distil.,	5.0
M. F.	
Sig.—As a hypodermic of 1.0 to be injected once daily.	

℞. Physostigmin sulph.,	0.05
Pilocarpin muriate,	0.1
Aqua distil.,	20.0
M. F.	
Sig.—1.0 injected every three days.	

Certain Diseases of the Spinal Cord.

The following diseases are caused directly and indirectly by some change or morbid condition of the spinal cord.

Compression of the Spinal Cord. Myelitis by Compression.—By this name is understood a slow compression of the cord; due to a pathological process which alters and straightens the vertebral canal; this may be due to thickening of the membranes as in pachymeningitis spinalis ossificans, already mentioned, from tumors of the vertebra or meninges, exostoses or inflammations of the intervertebral discs. As to tumors in the vertebral column very little is known in dogs; sarcoma; cholesteatoma, and melanoma have been found by a number of observers, exostoses projecting into the vertebral column may be caused by periostitis of the intervertebral discs of the lumbar region; this is frequently seen in old dogs. Inflammation of the intervertebral discs is caused by violent and continued jumping, particularly in performing dogs. These formations are at first soft formations, which later become hard and project into the vertebra and in advanced cases project from one vertebra to another in spine-like processes. While the dorsal lumbar vertebræ are the most frequently affected, it has also been observed in the cervical portion of the column.

Clinical Symptoms.—The symptoms are those we would find as a result of compression of the spinal cord and the origin of the nerves. The animal at intervals shows pain, moaning, barking or howling, stiff cautious movements, and evidence of partial or complete paralysis of certain muscles of the body, also motive disturbance of the bladder and rectum, erection of the penis. Certain valvular diseases of the heart, causing a venous hyperæmia, arterial anæmia of the medulla spinalis or thrombus of the femoral arteries produce symptoms similar to this disease, and it is well to carefully examine the heart in a case of spinal paralysis. The **treatment** is useless, as it is incurable.

Hemorrhage of the Spinal Cord. Apoplexia Spinalis.—Hemorrhage may occur between the membranes of the cord as well as in the cord itself, and in most instances is due to traumatic influences. One observer found in a dog that fell while running very fast a profuse subdural hemorrhage extending from the second cervical vertebra to the sacrum; there was also more or less hemorrhage in the central sections of the spine of the cervical and lumbar regions; the animal lived three days.

The clinical symptoms either as convulsive twitching or paralysis appear, but may disappear very quickly if the blood is reabsorbed, or the animal dies in a short time. In some cases partial or complete paralysis may follow as a result of the hemorrhage.

The treatment consists in absolute rest, cold compresses to the spine, and the internal administration of iodide of potassium. Much better results are to be expected if the case is treated at its onset.

Fractures, Luxations, Diastasis of the Vertebral Column.—Fracture of the vertebral column is caused by blows, falls, being run over by a wagon or automobile, and is detected by deformity or curve of the vertebral column, by pain on pressure and want of mobility of the spine. It is extremely difficult in fracture of the spine to get actual crepitation. In fracture of the lumbar vertebra and of the sacrum, the place of fracture may sometimes be felt by introducing the finger into the rectum and feeling along the column. Fracture of the cervical vertebra invariably causes death in a very short time, that is if the arch of the vertebra is broken, but frequent recoveries are made where the fracture is of the transverse or oblique processes. If the latter are injured, they heal leaving a torsion or crookedness (torticollis). Fractures of the lumbar or sacral region, while not necessarily fatal, cause such helplessness and misery that the animal should be mercifully destroyed.

Luxations (**diastasis**) of the spine without fracture are extremely rare, although we may occasionally find distortion or sprain of the cord with compression and tearing of the vertebral discs. In such cases the prominent symptoms are great rigidity of the vertebral column, stilted gait, local pain on pressure. The symptoms may disappear quickly or they may increase rapidly and develop into acute inflammation of the intervertebral discs (see page 250). Rest, Priessnitz compress on the lumbar region, later on local friction or massage of the affected part.

Concussion of the Spinal Cord. Commotis Medullæ Spinalis.—This is apt to occur from the same causes as produce commotis cerebri. This condition may be present and the animal be completely paralyzed and no change is found in the vertebral column. Frequently animals affected in this way make a very speedy recovery and it is not wise in doubtful cases to destroy the animal too hastily.

Tabes Dorsalis.—This disease is a degeneration and atrophy of the spinal cord, found as a result of syphilis in man. Friedberger and Frohner thought they found it in the spinal cord of several dogs that had ataxia. The writer is of the opinion that it does not occur in the canine race, for among the thousands of dogs he has posted he has yet to see a case that he could consider was affected with the disease.

Syringomyelia.—Lienaux describes one case of this peculiar disease, which is characterized by fissures and hollows in the cord. The disease developes very slowly; at the onset we find disturbances of mobility, weakness, paralysis of the posterior extremities, the animal has a peculiar hyena-like walk, urination and defecation remain normal, the appetite is good, sensation in the posterior extremities and later in the anterior extremities is gradually lost. On examining the spine, it is found to contain a number of cavities filled with clear serum; these cavities are in the gray matter, particularly in the posterior section, and in the commissures of the anterior section of the cervical and dorsal regions.

Paralysis of the Nerves.

Paralyzed nerves may be due to some morbid process of the central nervous system, also to traumatisms, such as tearing or bruising of the nerves, or compressing the nerves by neoformations, hemorrhagic extravasations, exudates, enlarged lymphatic glands, swollen tissues, dislocated bones, etc. Inflammation and subsequent paralysis of the nerves may also be caused by cold (neuritis rheumatica), by paralysis or paresis, causing an atrophy of a muscle or group of muscles, and in the case of a mixed nerve going to a certain part, to have disorder of sensation, neuralgia, or anaesthesia. Convulsions are extremely rare and if they appear would indicate some central pathological process.

We will take up particularly paralysis of the peripheric nerves.

Paralysis of the Facial Nerve.—The most frequent cause of this condition is disease of the middle ear, caries of the petrous bone, neoformations or inflammatory processes of the region of the parotids, traumatisms at the place where the nerve goes around the maxillary or the periphery of the nerve, cold—this latter cause, however is rare; also to pathological processes in the skull and base of the brain, or it may follow as a result of distemper. Generally the affection is unilateral (monoplegia facialis). A bilateral paralysis (diplegia facialis) is invariably of central origin.

In the case shown in the accompanying figure (Fig. 132) the symptoms were as follows: The end of the nose, the superior and inferior lip and the chin turned to the right side, the left eye was wide open and could not be closed, the left cheek was relaxed and sunken, the left ear hung downward and backward and could not be lifted by the animal, as was the right ear when the animal was called, or his attention attracted, the animal ate with difficulty but drank water normally. The cause of this condition was not defined. The animal was treated with the faradic current and in ten days was discharged cured. A number of observers report favorable recoveries.

Motor Paralysis of the Trigeminus. Paralysis of the Masseter Muscle. Submaxillary Paralysis.—This form of paralysis is a common symptom of rabies; therefore all cases of this kind must be regarded with suspicion (Fig. 133).

It is observed following distemper, in hemorrhagic gastro-enteritis, and also as a result of certain forms of bacterial poisons, and also in some affections of the brain, morbid processes at the base of the cranium, such as hemorrhages, neoformations, gliosarcoma. It would appear at times as if the motor nuclei of the trigeminus are squeezed by the muscles of mastication, for instance when great effort is made to bite and crush particularly large bones. Rheumatic influences are also said to cause it.

The chief symptoms are as follows: the mouth remains open, the inferior maxillary hanging limp; if paralysis continues for any length of time, the muscles atrophy. Recovery is rare.

Paralysis of the Radial Nerve.—This is very rare and occurs as a result of traumatism or a sequela to distemper or cold. As the radial nerve controls the muscles of extension of the leg, the anconeus muscle and extensor muscles of the forearm the animal is unable to extend the leg but keeps it bent with the foot turned back and steps on the front of the foot in walking as it is dragged along, the muscles of the leg become atrophied, and the animal stumbles and staggers when walking. Partial paralysis may result from tumors or fractures of the scapula or to injuries to the region of the shoulder, particularly when an animal going at great speed strikes the shoulder against some hard object. Recoveries from this condition are quite common.

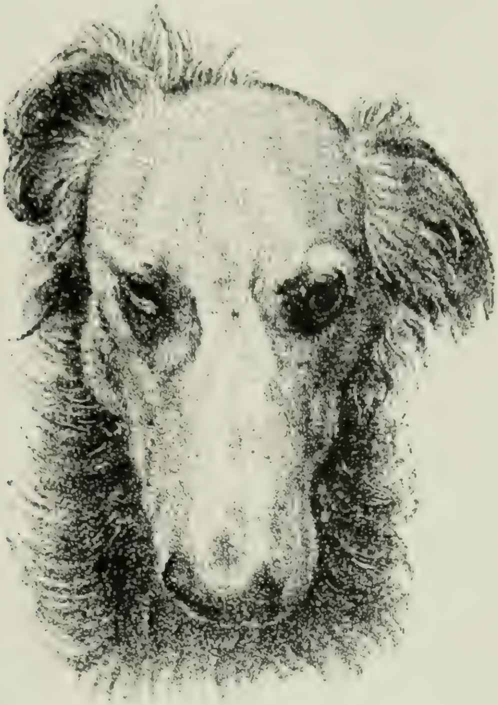


FIG. 132.—Facial paralysis of the left side.

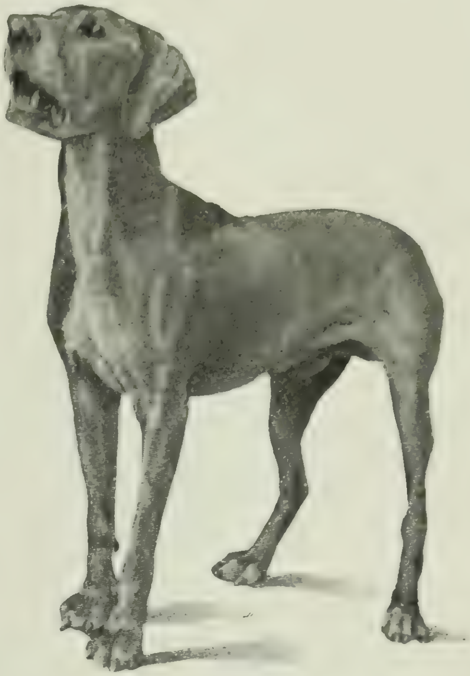


FIG. 133.—Paralysis of the lower jaw.

Paralysis of the Ischiadicus.—This is rare and occurs as a result of blows, falls, as a result of distemper, and from unknown causes; there may also be observed a cross paralysis of the hind quarters and also one anterior limb. The hind leg is dragged and the skin worn off the dorsal face of the toes, but the animal can sit on the affected leg if it is brought into position. One observer has seen paresis of the peroneus in a hunting dog; in walking about every ten or twelve steps the animal made an extra long step and when the animal sat down the hind leg was turned backward and upwards. One case was caused by the animal being injured while creeping under a bed.

Paralysis of the Cruralis Nerve. Paralysis of the Femoralis and Quadriceps.—In this case the animal cannot step with the hind leg as the articulations flex abnormally; this condition is quickly followed by atrophy of the quadriceps. One observer could define no cause for the condition, and the animal made a good recovery in five weeks.

Paralysis of the Obturator Nerve.—One case of this kind was described by Schimmel in which a ladder fell on the animal. When the animal walked, the one leg was curved and at each step it was thrown outward and forward and there was great atrophy of the adductor muscles. Regular exercise led to a gradual improvement of the condition.

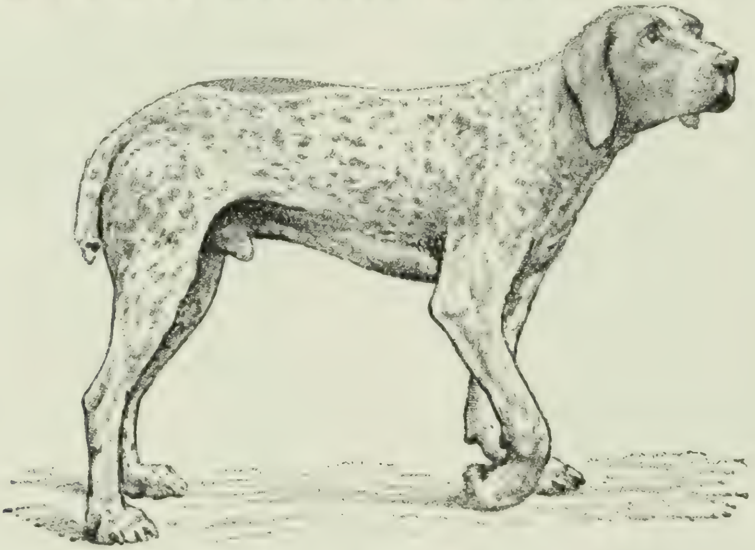


FIG. 134.—Paralysis of radial nerve.

Paralysis of the Auditory Nerve. This occurs as a congenital condition in albinos. Particularly seen in White bull terriers and West White Highland terriers, when breeds that have originally been brindle are bred by careful selection until they are white. Also as a result of disease of the inner ear or affections in the region of the medulla oblongata and terminates in deafness. Additional information on this subject is given in the chapter on Deafness. Paralysis of the Vestibular nerve may occur in the course of inflammatory processes of the middle and internal ear, hemorrhages in the internal ear, caries of the petrous portion of the temporal bone and concussion of the brain. When the paralysis is confined to one side the head is inclined in that direction while abnormal movements are similarly characterized. In case of bilateral paralysis the animal's sense of equilibrium is affected.

In regard to paralysis of the tongue. It is caused by paralysis of the hypoglossal nerve.

Prognosis and Treatment of Paralysis of the Nerves.—The prognosis can never be regarded as favorable; it is true certain cases already mentioned have recovered, but the majority of cases are always to be regarded as doubtful, particularly when their peripheric nerves have undergone some pathological change.

The first thing to endeavor to do is to try and remove the cause of the irritation of the nerve; if this is due to the presence of a tumor, extravasation of blood or serum, cicatricial tissue or dislocation of an articulation we endeavor to remove the exciting cause or lessen the inflammatory or purulent conditions in the neighborhood of the nerve. If a rheumatoid cause is suspected, administer salicylic acid, salol, aspirin, or antipyrin. Massage may also be used combined with a certain amount of well regulated exercise. The electric current may be employed, the negative electrode being applied as near the root of the nerves as possible, and the positive pole is moved along the branches of the nerve and the affected muscles. Subcutaneous injections of strychnin or veratrin might be of value in some cases. Herbig recommends systematic injections of vaccineurin, a mixture of autolysates of B. prodigiosus and staphylococci.

Polyneuritis Infectiosa.—Under this name Lellmann describes a case of an adult terrier which is similar to primary multiple neuritis in man. The posterior extremities of the animal were completely paralyzed, and their temperature was slightly lower than the rest of the body, the spinal reflexes were gone, with slight opisthotonos, and hyperesthesia in various parts of the body, the heart being weak. As the disease advanced, a herpes eruption appeared, and nodules appeared along the course of the following nerves: tibialis, ischiadicus, peroneus and cruralis. The animal was given warm baths, later cold showers and massage, and gradually the symptoms disappeared and in three months the dog had entirely recovered.

Facial Twitchings. Facial Spasms.—Muscular twitchings occur in the region of the facialis, as a sequence to distemper and also in chorea; and occasionally they occur in meningitis and certain forms of encephalitis; one case described by Cadiot, Gilbert and Rogers was named "Tic de la face," where the twitching followed distemper, and was cured by the removal of the bulbus (original nuclei) of the facialis. There is no relationship between facial twitchings of the dog and the "tic convulsiva" of man.

Epilepsy.

(*Falling Sickness.*)

Epilepsy is a disease of the brain, which is not rare in the dog. It is chronic in its course, and appears to be hereditary. Its chief symptoms are irregular attacks of unconsciousness and in older cases accompanied by acute characteristic muscular convulsions. True idiopathic epilepsy, generally incurable, is frequently confounded with the so-called symptomatical epilepsy, that is the epileptiform convulsions which appear as a symptom of grave pathological conditions of the brain, or some other change in the skull such as reflex irritation of the peripheral nerves.

Etiology and Pathological Anatomy.—The causes of epilepsy are unknown, but at the same time there is no doubt that certain diseases of the brain and its membranes, especially chronic diseases, have recently been demonstrated by Otto to be hereditary. This disease may appear at any time during life, and even in advanced age; great excitement and fear seem to play some part in its development. Wasting diseases very frequently cause epileptiform seizures which are similar to true epilepsy, and we may also observe in some cases a reflex epilepsy which does not resemble true epilepsy in any way except in some general symptoms. These will happen after traumatic lesions of the peripheral nerves, in animals harboring intestinal parasites, and in animals having poisonous substances in the intestines. We may also observe epileptiform convulsions in distemper.

In true epilepsy there are no anatomical alterations to be found in the brain itself. Whenever they are found they cause epileptiform convulsions. It is therefore certain that in a case of epilepsy it is only due to some temporary irritating condition, and that the membranes of the brain are the starting-point of the irritation.

The experiments which have been made upon dogs in connection with this disease by Ferrier, Eulenberg, Landois, and others, are very interesting. They found that with great irritation of the motor regions of the large brain (the cerebrum) a complete attack could be produced. This begins with twitching of the muscles which belong to that centre. It then becomes extended over the corresponding group of muscles on the other side, producing shocks and twitching of the whole muscular system of the body from tonic and, later, clonic convulsions. The convulsions extend from centre to centre, and they never miss any region, but run consecutively from one to the other. If the chief centre is cut out, the convulsions will not be present in that region during the epileptiform attacks. Irritation of the subcortical white substance of the brain also causes epilepsy. This begins, however, in the muscles of the same side.

Bromide of sodium administered for some time has been found very valuable in preventing epilepsy caused by membranous irritation.

From the above experiments it can be readily understood that the cortex of the cerebrum is the original centre of epileptic attacks. It is hard to explain, however, the actual cause of this irritation. Epilepsy can hardly be caused by overstimulation or feeding, for, as a rule, the largest number of true epileptic subjects are weak, delicate, and anæmic; but at the same time we often see vigorous, well-fed dogs of all ages suffering from this disease. There are many cases in anæmic animals which, under treatment, gradually improve, at the same time the epileptiform attacks becoming less and less as the animal improves. It is doubtful if these cases can be called true epilepsy.

Clinical Symptoms and Course of the Disease.—In acute attacks of epilepsy the symptoms begin suddenly, or they may start with slight premonitory symptoms, or we may see both forms alternately in different seasons in the same individual. In the early stages the animals run in a circle, are restless, have a staring look out of their eyes, or remain standing with outstretched legs and shake their heads from side to side. We have seen clonic convulsions followed by loss of consciousness, and in some cases a rapid change into tonic convulsions. The muscles of mastication are especially affected, the jaws are clamped, the saliva turned to froth, the tongue may be bitten, and the blood turns the saliva red. Single muscle contractions follow one another with astonishing rapidity, so that the saliva which lies in the mouth is turned into foam. The convulsions which are now tonic extend over the whole muscular system. The body and neck are drawn backward or sideways; there is twitching of the ears, the legs are stretched; the respirations seem to cease. This tonic form of convulsion lasts but a short time. A few seconds after its appearance it has altered into clonic cramps of the muscles, especially noticed in the legs, which are frequently twitched, and the legs may move rapidly as if the animal was running. After a few minutes these twitchings stop; the animal lies on the ground for some time; it finally rises and recovers very quickly; some animals, however, are dazed and everything seems strange, they are afraid of their owner, or do not recognize him. They creep around and hide in dark corners, and after the attack has passed off they are greatly fatigued, frequently sleeping several hours at a time, and in rare instances show a tendency to bite. The pulse and temperature during an attack of this kind present no alteration of any consequence. The mucous membranes of the head are reddened and congested, sometimes cyanotic. This is noticed at the termination of an attack, and is probably due to the interruption of respiration, and the slight respiratory movements, and frequently an involuntary passing of fæces and urine is noted during these convulsions.

There are also certain forms in which the animal is restless, running from side to side, or having fainting spells (dropping on one side), slight muscular twitchings of the head or extremities, and occasionally, in mild attacks, a very slight twitching of the jaw, rolling or winking of the eyes. The duration of these attacks varies, as a rule not lasting very long, generally only a few minutes, although severe attacks have been known to last for five or six hours. Their frequency is very uncertain; some animals have had several attacks daily, while in others they have appeared at intervals of months. A peculiar feature of some cases of true epilepsy was the frequent attacks on the slightest excitement. In the interval between the attacks, the animal seems perfectly normal, and only in very rare instances are the animals subject to these attacks dull or stupid. This disease is rarely fatal but an animal may either injure itself during an attack or a very severe attack may cause death by suppression of respiration or paralysis of the heart. The differential diagnosis between this condition and a simple fit, or convulsion, is easily made on getting an exact history of the case.

In connection with this disease we must devote a few words to **epileptiform convulsions** in young animals. We very often see epilepsy in weak, debilitated animals which are backward or poorly fed, and which have rickets; they also occur as a consequence of reflex irritability during the course of catarrhal diseases of the digestive tract and of the nasal cavities. We also notice them after the absorption of large quantities of fermenting, indigestible food, in constipation, from the presence of pentastoma, and in cases of intestinal parasites, at the time of teething, in acute affections of the ear, or parasites of that organ, and also as a consequence of great physical excitement. We often see spontaneous convulsions; these are very similar to epilepsy, and are probably of reflex origin. In some of these cases we may have to deal with true epilepsy, but, as a rule, they may be ascribed to an undeveloped form of distemper, or to some poisons, or uræmia. In some cases it may be due to some brain affection, such as congestion of the membranes. It cannot be denied, however, that there are a great number of convulsive attacks for which the cause remains obscure.

We may therefore conclude that we can only obtain an approximative insight into these convulsions by the symptoms which are presented. Frequent occurrence of eclamptic attacks with a short interval between must be considered as a very serious symptom.

Therapeutics.—No agent seems to have any decided effect upon epilepsy. The writer has tried a number of remedies, one after another, without result. Bromide of sodium seems to be the best (this is preferable to bromide of potassium, as it has no detrimental effect upon the appetite), provided it is given in substantial doses and kept up for months. With this drug it is always possible to prolong the interval between attacks; they are also shortened and relatively less serious. Sometimes bromide of potash, soda, and ammonia are administered together in the proportion of 2–2–1 and seem to have a more desirable effect. Other agents such as oxide of zinc, arsenic, nitrate of silver, belladonna, hyoscyamus, valerian, bromohydrate, cold water, and electricity are now rarely used.

The therapeutic treatment during the convulsions consists in the use of applications of cold water to the head; prevent the animal from injuring itself. If one attack follows closely after another, use inhalations of chloroform, or clysters of chloral hydrate; and give internally large doses of bromide of sodium, morphia, or similiar sedative agents, and endeavor to keep the animal as quiet as possible after the attack.

℞	Bromide of potassium	15.0
	Aqua,	150.0

S.—One teaspoon to one tablespoonful three times daily.

or	Am. bromide	3.0
	Potas. bromide	
	Sod. bromide, āā	6.0
	Aq. dist.	200.0

M. D. S.—Dose as above.

In epileptiform convulsions in young animals we endeavor to remove the cause and administer the salts of bromine, chloral hydrate, sulphonal (0.5 to 4.0), hedonal (1.0 to 4.0), hypnon (0.5 to 2.0), veronal (0.5 to 1.5).

℞.	Chloral hydrate,	5.0
	Mucilage acacia,	
	Syr. aurenti cort., āā,	20.0
	Aqua distillata,	100.0
	F. M.	

Sig.—A tablespoonful every two hours.

℞.	Hedonal,	12.0
	F. M. capsule et divid. No. 12.	

Sig.—One daily.

Chorea.

(*St. Vitus's Dance.*)

Etiology.—Chorea we no longer consider an independent disease, but the result of a number of complications which should really be classed under other heads; for instance, in young dogs that are insufficiently fed, or from obscure cerebral diseases. It is also seen in myelitis, and some cases of symptomatic chorea, but in the majority of cases it must be attributed to some pathological change as a result of distemper.

In true chorea of man we do not see any pathological alterations of the brain, and in the few cases which the writer had to consider as true chorea on account of the anæmia, absence of any symptoms of distemper, or other diseases of the brain and spine. The toxic effect of bacteria present in the intestines has been advanced as a possible cause by some, but there is little probability that the convulsions were restricted to certain special muscular groups, and not, as in human chorea, to irregular regions—that is to say, in the various muscular centres of the body. In some of these cases the animals were destroyed, and their post-mortems gave an entirely negative result, there being no apparent pathological change in the central nervous system. As a rule, the affected animals are in an anæmic condition and show all the effects of bad nutrition, and, after some observation, we are convinced that with improvement in the general system the choreic symptoms become very much lessened. Joest in the Zeitschrift für Tiermedizin, 1904, gives a detailed account of the disease.

Clinical Symptoms and Course.—We define this disease as a persistent clonic convulsion of some muscular group in certain parts of the body. For instance, we see shaking of the head, twitching movements with one or two legs, regular, and also an automatic opening and closing of the mouth, irregular movements of the tongue, and an undulating action or movement of the whole body. If the patients are left to themselves, the twitching action is generally less marked, and under physical excitement becomes much more aggravated; and are also increased when eating, and during catarrhal conditions of the air-passages, or the intestines, stomach, etc. The clonic movements lessen during sleep and under the influence of ether, chloroform, and bromo-ether, but morphia and chloral have little or no influence upon them. The course of this disease is slow, and may extend for months and years; but, as a rule, the symptoms lessen and in very rare instances may disappear entirely. A fatal termination is only to be feared when complications arise.

Therapeutics.—The author has tried all the various agents recommended in this disease, but without any decided results. Arsenic, either in the form of Donovan's or Fowler's solution, or alternated with some preparation of iron, has given the best results. Schimmel recommends cacodylate, but these drugs must be given for some time, and it is only after prolonged administration of salines that any favorable result is observed. The writer thinks that more benefit is derived from quiet and nutritive diet, particularly meat, than anything else.

Antipyrine, which is used in man, is of not much service in the dog. Electricity in one case produced decided lessening of the symptoms after regular application of slight galvanic stimulation of the head and along the vertebral column. Hypnotics have at best only a temporary effect.

Eclampsia of Nursing Bitches. Parturient Eclampsia.

This term is applied to the peculiar tonic clonic convulsions that are observed in nursing bitches without observable disturbance of consciousness or sensibility. The most frequent victims are young, tender, pampered but well nourished bitches with actively secreting mammary glands (lap and house dogs) and particularly those with a light colored hair coat.

Etiology.—The causes of this disease are very little known. According to Hertwig it may be caused by cold, stagnation of the milk in the udder, taking away the young too soon, and sometimes by worry. In two-thirds of the cases of true eclampsia all the young are still with the mother, and invariably we find the animals attacked to be excellent mothers, and the litters are generally strong, and healthy, and lay on flesh very quickly while the mother loses it. The onset of the disease is generally seen at the end of the second or third week, it may be seen within the first few days after parturition—but usually not before 48 hours and the animal may be dull and not right for several days before the acute symptoms show themselves. In some cases observed, the disease developed after either one or more pups had been taken away from the mother. In the onset of the disease the mammary glands contain much milk, and the bitches most frequently attacked are small, delicate (house dogs and pet animals), and, as a rule, have a light coat. Friedberger and Frohner are of the opinion that the disease may originate from anæmia of the spinal cord or, in a reflex way, from the mammary glands and uterus, as they found anæmia of the papilla of the nerve by making an examination of the retina with the ophthalmoscope. Hutyra and Marek state it may also be produced by the direct action of toxines on the sexual organism or on the motor cells of the anterior horns of the spinal cord, and other observers think that there is a similarity between this condition and puerperal fever of the cow. With this last theory the writer is inclined to agree. According to the statements of several authors, severe anatomical disturbances of the brain may be caused directly from the mammary glands. Friedberger has observed two bitches that had eclampsia without having puppies.

Eclampsia. In conclusion to the above, brief reference should be made to eclamptic convulsions referred to on page 227. These are observed chiefly in young poorly nourished, stunted, rachitis dogs and are undoubtedly of reflex origin. They are occasionally observed in the beginning or in the more advanced course of inflammatory processes of the digestive tract or of the nose; e. g. Pentastomum infection, presence of intestinal worms, serious affections of the auditory apparatus (presence of mites), during teething and as a result of great psychic disturbances. In certain cases the exact causes cannot be determined, and this is true of certain localized as well as of very general attacks that may greatly resemble true epilepsy. These reflex convulsions have nothing in common with convulsions observed in the course of distemper and other infectious diseases nor with those appearing in the course of certain cases of poisoning, uremia, congestion or inflammation of the brain and of its envelopes. However, it is frequently impossible to recognize their true nature without observing their further course. In any case, frequent repetition of eclamptic convulsions must be regarded as a grave symptom.

Clinical Symptoms.—The disease may appear in from 48 hours to thirty days after whelping; very rarely later than this time; in the majority of cases appearing at or about two to three weeks. In one case of Friedberger's fifty days elapsed. It comes on suddenly without any marked symptoms. The animals become restless and anxious; they have a staring expression of the eye, short, rapid respiration, reddened mucous membranes; they show no pain on pressure on the walls of the chest, neck, or abdomen. After a short time (about a quarter of an hour after the appearance of increased respiration) they become paralyzed, are no longer able to stand on their feet, and remain for some time with their legs stretched from them. A slight increase of temperature has been observed in several instances at the onset of the disease. The dog lies on her side with her legs firm and tense; the muscles of the body hard and quivering to the touch; the joints are stiff and hard to bend; and at intervals we see clonic convulsions of all the muscles, especially those of the extremities, and the respiratory muscles are especially involved. The respirations become more rapid as a consequence of this, and finally the mouth is opened and the tongue protrudes, while the animal breathes with great difficulty. The pulse is small, firm, and sometimes irregular, and always quick; the eyes are staring and protruded, and there is an anxious look in the face. All the visible mucous membranes are cyanosed. The saliva which accumulates in the mouth is either swallowed convulsively at certain intervals, or, as is generally the case, it dribbles out of the corners of the mouth. As a rule, consciousness is not disturbed. The pupils are normal in size; reflex action is present. The animal seems to notice external objects or impressions, such as calling the patient, or noticing one it knows coming into the room. The appetite is lost; the normal discharges are entirely suppressed; although the urine and faeces may be involuntarily voided during the attack; the urine, after such an attack, gives an albuminous reaction. The attack may last for twenty-four hours, but generally varies a little in intensity. If the attack is very acute, the animal falls into a deep comatose condition and dies in about forty-eight hours after the onset of the disease from apoplexy and paralysis, or the cases commence to recover, regain consciousness, and frequently make good recoveries.

Therapeutics.—Taken in time and treated energetically the animal invariably makes a good recovery. The first thing to do is to remove the puppies, and either feed them artificially or get a foster mother for them. Any of the narcotics can be used, and, as a rule, produce good results. Give morphia, 0.002 to 0. 005 gm. of the muriate, diluted with water. As a rule, a few minutes after the hypodermatic is administered the animal becomes quiet and rests easily. Inhalations of chloroform, chloral hydrate, bromide of potassium, etc., are also recommended. Warm baths and friction produce relaxation of the tense muscles; the "cold pack" is also particularly useful; take a bed sheet or some such large piece of muslin, saturate it with cold water, wring it out thoroughly and wrap the animal up in it, enclosing the whole body, of course, letting the head free, allow the animal to lie in this for two or three hours. Valerianate of zinc in 05. gm. dose every two hours. Urethane 5 to 20.0. Hypnon 0.25.

Divers Diseases of the Nerves.

Diseases of the nerves in which there is no anatomical change.

Catalepsy.—Catalepsy, or "cataleptic rigidity," is a rare disease in which there is a peculiar rigidity of the muscles, and the animals may be placed in certain positions and remain perfectly rigid. Consciousness and sensitiveness seem to be suppressed entirely. Such an attack lasts for hours and recurs daily, this condition lasting for weeks. The rigidity may start in the muscles that are in action at the time the animal is seized with the attack, and rapidly extend to all the muscles of the body, until the animal remains fixed like a statue, and may finally die of starvation, being unable to eat or drink. In many cases they finally relapse and die in a short time, or they have been known to die in six or seven days, or the condition was followed by general muscular weakness, in which the muscular walls of the bladder and intestinal tract were also involved. There is invariably subnormal temperature and coma. If this is really a disease, or merely a symptom of some brain complication, the writer has not been able to positively determine.

Hertwig mentions as causes of catalepsy, cold, fright, overloading the stomach with indigestible food, and metastases in various diseases. Frohner considers this disease as a purely functional neurosis of the brain and spine; he could not find any definite alterations in the central organs, in catalepsy, but he found occasionally certain secondary alterations in the muscles; namely, hemorrhages, dark venous swellings, and fatty degeneration of the muscles, also degeneration of the fibres of the heart.

No practical therapeutic treatment is known. Sedatives such as bromide of potassium and morphine, electricity and cold douches, are used as a means of restoring the disturbed reflex irritabliity of the nervous system.

Psychosis.—It is a question whether psychological disturbances can occur in the dog which has not intellectual elements of the cerebrum possessed by man, but it is reasonably certain this question can be answered in the negative. It is evidently some disturbance in the sphere of the will. In one case of a dog ten years old, the muscles affected were the limbs and those of mastication. If the animal had a portion of food in his mouth and an attack came on, he could not masticate it, but if it was small he would swallow it. The attack lasted about a minute and during that time the animal kept his eyes half closed, and the pupils remained normal, as was sensation and consciousness. The attack could be produced if the animal was struck on the lumbar region. Gradually the attacks became more frequent, until the animal lost power of the limbs, became emaciated and was finally destroyed. Careful microscopical examination of the cerebrum failed to find any change from normal.

Concussion Neurosis. The serious nervous affections that are met with in dogs in large cities as a result of more or less serious collisions with street cars, automobiles, etc., are described under this name by Jacob. The effect upon the animal is a complete change of general behavior, they have an uneasy, frightened and timid look, become sluggish in all of their actions and frighten and tremble at the slighest provocation. The pulse is irregular and unequal; appetite capricious. They try to avoid busy streets and in quiet sections they slink or steal away close along the sides of buildings. Recovery requires weeks or months of good care and the administration of bromides. Hunting dogs may be permanently ruined.

Convulsions of the Diaphragm, Convulsive Hiccough.—A convulsion of the diaphragm, similar to hiccough in man, may be caused by a central or peripheral irritation of the phrenic nerve, or by reflex irritation from the digestive tract. It is rarely seen in the dog; in one case the animal had catarrh of the stomach, and the contractions of the diaphragm were the same in number as the heart beats, certain muscles of the head, neck, and extremities were also affected. The treatment consisted in the subcutaneous administration 0.01 of morphia, if the convulsion continues over any length of time, but as a rule, the attack lasts only from fifteen to thirty minutes.

DISEASES OF THE THYROID GLAND.

Basedow's Disease.—A disease similar to that found in man, has been observed several times in the dog. The three following symptoms are characteristic: Exopthalmus (staring or bull's eye), tachycardia (palpitation and acceleration of the pulse) and struma (enlargement of the thyroid gland, with an altered secretion of that organ). It must be regarded as a general neurosis. In an animal not quite a year old, the eyes protruded from the orbit, movement of the eyelid (lowering and elevation) was absent; the patient was restless, moving from place to place, the pulsations were 130 and the respirations 30 to 35. The pulsations of the heart could be easily felt through the thorax. The appetite was irregular. The animal had quite a large goitre. After being treated eight days the animal was destroyed. The brain was anæmic and the thyroid gland was greatly increased in volume and there were three secondary glands, and the right ventricle of the heart was greatly dilated.

Treatment of this disease, which is generally chronic, consists in rest, the animal must be kept away from any excitement given food of a nourishing and substantial kind, and must be easily digestible. Administer iodide of potassium, bromide of potassium or iodide of sodium. In one case in an old pug dog, the animal made a good recovery after four months treatment. Iodine in the form of tincture of iodine by inunction, has given good results in some cases. Iron preparations, Fowler's solution, milk, or thyroid serum or rodagen, all prepared in animals that have had the cultivated serums of the thyroid gland, injected intravenously. If this method of treatment does not produce results either remove the enlarged thyroid (struma) or ligate the thyroid arteries.

Cachexia Strumipriva.—When the thyroid gland is removed, there appear certain pathological phenomena that are the opposite to Basedow's disease. In two or three days after removal of the gland, sometimes a later period, the extremities become stiff, clonic muscular twitching and convulsive movements of the muscles of mastication are seen with trembling, dyspnœa, acceleration of the heart, stupor, albumen in the urine, emaciation and death in about a month. In cases where only one-half of the gland was removed, there is no systemic disturbance, and the same occurs if there should be secondary thyroid glands which perform the functions of the extirpated gland. It is possible to prevent a fatal termination by injecting the animal with thyroid preparations, or administering the preparation internally.

Hypertrophy of the Thyroid Gland. Goitre.

The term Goitre is applied to all non-inflammatory enlargements of the thyroid gland that are due either to simple hyperplasia of the glandular tissue, or follicles (Struma simplex, Str. parenchymatosa, Str. follicularis, respectively) and not infrequently to more or less extensive cystoid degeneration attended with the formation of cavities, usually with ropy, gelatinous contents (Struma cystica, Str. gelatinosa) or, to proliferation of the connective tissue (Str. fibrosa, fibrous goitre). In other cases these noninflammatory enlargements are due to enlargement of the blood vessels, especially of the veins (Str. vasculosa, Str. varicosa) or to carcinematous and possibly also to sarcomatous degeneration (Struma maligna or Str. carcinomatosa and Str. sarcomatosa). Occasionally calcification and ossification have been observed. Struma parenchymatosa (also referred to as Struma mollis to indicate its soft consistency) is the form usually seen in young dogs or pups and may be congenital (Struma congenita). In older dogs Str. fibrosa (firm consistency) Struma carcinomatosa (nodular) are the forms most frequently observed.

The degenerative process usually affects the entire gland, uniformly bilaterally. The malignant forms, however, may appear on one side only or affect the two glands unequally. These forms are not always confined strictly to the glands themselves but may attack the adjacent tissues. Metastases in the lungs and thoracic lymph glands are also frequently observed.

Etiology and Clinical Symptoms.—The true cause or origin of goitre has not as yet been defined: In man, horses, mules and cattle the disease is very prevalent in certain mountain districts and for this reason soil peculiarities have been suspected (mineral waters), but in the dog this cause can hardly be said to hold good, as in canines, it occurs in all countries and under all conditions, and appears where goitre in other species is extremely rare. One observer is inclined to think it is caused by the straining of a collar in harness, or to any active exercise; chronic heart disease seems to have some bearing on the disease, but why, has not up to the present time been definitely stated. Without a doubt, heredity is a predisposing cause (struma congenita). Young animals have proportionately a very large thyroid and it becomes reduced gradually as the animal grows older, but occasionally the opposite occurs, and instead of growing less it gradually increases.

Goitre is very easily recognized, directly below the larynx on both sides of the trachea. It is painless, there is no local increase in temperature, it may be hard or soft, sometimes irregular, sometimes as large as a closed fist, and in extremely large ones from its weight it hangs down from the throat. If the goitre is very large it may interfere to a certain extent with deglutition. In cystic goitre the cysts can be easily distinguished on manipulation. The malignant forms are frequently uneven, irregular and nodulated, and vary in consistence (Fig. 98).

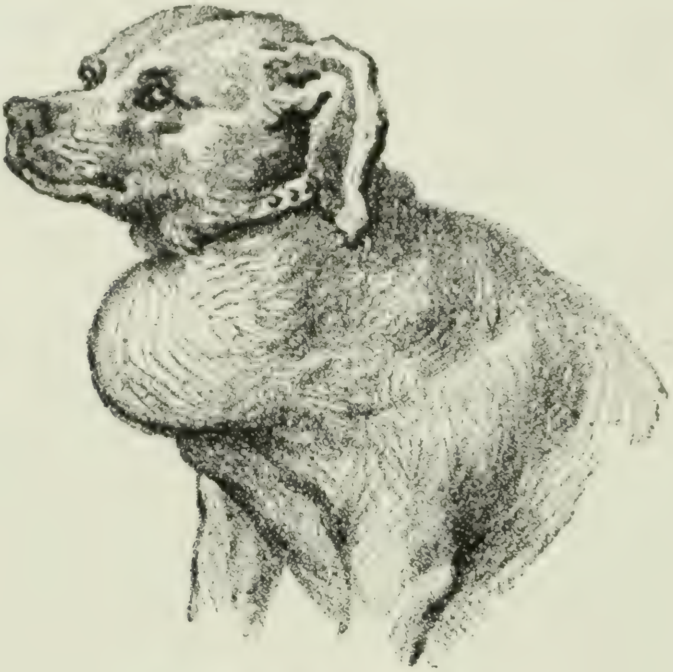


FIG. 135.—Malignant struma.

Treatment.—It is either medicinal or operative. Medicinal treatment is only useful in the parenchymatous or cystic goitre, the latter only when it is not too far advanced and consists in the administration of iodine either internally in the form of iodide of potassium, or iodide of sodium in moderate doses, (0.1), or friction externally, iodine or iodide of potassium ointment, oleates of iodine, or Lugol's solution of iodine. In one case a 10 per cent. solution of papayotin (vegetable pepsin) was injected into the tumor and in forty-eight hours the digested parenchyma of the gland was aspirated in the form of a milk-like liquid. The interparenchymatous injection of Lugol's solution of iodine are rather dangerous, but the writer has found a solution of iodoform 1.0 in ether and olive oil 7.0 much better.

Recently, preparations have been made from the thyroid gland of cows, thyroidin tablets (Merck), thyradin tablets (Knoll); these tablets are prepared commercially, each tablet contains 0.3 of normal thyroid gland, and we give 1 to 3 tablets daily. In weak animals at first give the smallest dose and carefully watch the animal. In the administration of too large doses you may have all the symptoms of Basedow's disease. Frequently, when the treatment is continued for some time and with favorable results, if the treatment is stopped, immediately the gland commences to enlarge again. Gillett gave the half of a freshly killed sheep's thyroid daily for four weeks to some affected puppies and found that the swellings began to lessen and finally disappeared.

When medicinal treatment has no results, or the struma is malignant, surgical treatment is necessary. In cystic goitre that is well developed, it can be opened, drained and filled with iodoform gauze. The malignant and fibrous goitre must be removed, but it must always be remembered that entire removal of the gland generally causes death in a short time (see Cachexia strumipriva). Only one-half of the gland must be removed, and in a case of bilateral, the one that is affected the more, as it is a question if iodothyrin or any of the thyroid preparations will arrest cachexia strumipriva, if it follows removal of the gland. On account of great vessels, recurrent nerve etc., in the neighborhood of goitre, the operation must be classed as one of the most dangerous operations in the dog.

Inflammation of the Thyroid Gland. Thyroiditis, Struma Acute.—This condition is extremely rare, and is generally of traumatic origin (bites, gunshot wounds, etc.). It forms large quantities of pus. This condition must not be confounded with those enlargements of the thyroid that occur in young dogs and are the result of catarrh of the larynx and pharynx. The periodical swelling of the thyroid that is seen in very young dogs, that swells and in a few days returns to normal size, is not in any way related to thyroiditis. The treatment of inflammation of the thyroid gland is to treat it as a surgical wound.

DISEASES OF TRUE INFECTION.

Distemper and Contagious Catarrhal Fever.

The definition of the word "distemper" describes an acute disease which is peculiar to the canine race, and is caused by a specific infection which finds its way into the system, as a rule, through the lungs and air-passages. It generally attacks young animals and runs its course as a catarrhal fever, affecting all the mucous membranes of the body, and is almost invariably accompanied with certain nervous symptoms, and usually with pustular skin eruptions.

Etiology.—Distemper is a disease which is contagious in the highest degree, and is only communicated by infection. It does not seem to have been recognized or described by the ancients or the writers of the middle ages. An animal affected with distemper can remain but a short time in any locality and affect every animal there, or it may be transmitted from a person or object that has been in contact with an affected animal. As a rule, few young animals escape distemper, generally contracting it before they are a year old, and dogs over that age very rarely take the disease. That, however, may be accounted for from the fact that dogs having arrived at that age have either come in contact with the disease previous to that and they have had it in a mild form, or the system was in such a condition, that they did not contract it. The disease affects animals but once during life, although a few exceptions are presented where animals have contracted it a second time. As a rule, delicate, weak, poorly-fed animals (vegetable diet), or animals which have been affected by some catarrhal disorder of the respiratory mucous membranes, contract the disease in its acute form; while, on the other hand, dogs which have lots of exercise, especially animals in the country or small cities, are mildly affected with the disease, and the rate of mortality is much less.

Distemper exists in all countries of the world. In the large cities it is found at any season of the year, while in the country it is generally more prevalent during the warm weather. The specific infection of distemper is not definitely known. It is undoubtedly a fixed and volatile virus* which enters the system by the mouth and nose, and it exerts its first influence on the respiratory passages. Vaccination of young animals by means of the mucous secretions from animals affected with the disease has been tried, and, as a rule, reproduces the disease.

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* By a " fixed and volatile virus " we understand a fixed virus that when secreted in the lungs, is carried out in fine division, in the particles of moisture in the expired air, and easily held in suspension in an atmosphere that contains a slight quantity of humidity.

Since 1905 there have been found, in succession, probably twenty different organisms (cocci, diplococci, streptococci—short and long ones —in the morbid products and tissues of affected dogs and accused of being the cause of distemper. In 1905 Carré published experiments upon the results of which he based his assertion that no microscopic organisms at that time recognized could be regarded as the possible cause of distemper but that the disease was due to a filterable, ultra-microscopic organism. By means of inoculation of filtered nasal secretions of affected dogs, Carré was successful in producing a disease, the symptoms of which resembled in every respect those of distemper. The filtrate used in these inoculations never produced any growth on any of the various media on which it was implanted. Inoculation of healthy animals with the defibrinated blood of dogs thus infected produced fever, catarrhal nasal discharge and pustules. The same blood produced no growth on culture media. This observation of Carré and the conclusions drawn therefrom have been accepted by many and particularly by French investigators, many of whom called attention to the possibility that other microscopically visible organisms, might exert an influence on the course of the disease. Among the opponents of these views Kragenow doubts the filterable virus theory and insists that the cause of distemper must be looked for among the numerous microscopically visible organisms already described.

In 1912 Ferry proclaimed Bacillus bronchisepticus (B. bronchicanis) which he found in the respiratory tract and also in the blood of infected dogs, and of which he was able to make pure cultures, as the true cause of distemper. Inoculation of pure cultures produced typical symptoms of distemper and infected animals yielded pure cultures of the bacillus. Independently of Ferry, Torrey and McGowan arrived at the same results. Among other recent reports relative to investigations as to the nature of the contagion of distemper those of von Wuschheim are of interest. The latter regards a small bacterium of the Paratyphus B. group as the true cause of distemper. Wunschheim had succeeded in growing pure cultures of Bacillus canicidus in 1905.

It is quite evident that up to the present date (1925) there has been nothing that research has found what might be called a definite understanding of the actual infecting material that causes distemper, but the bulk of evidence tends to lean to the theory that the specific micro-organism whatever it is must be ultra-microscopical.

Clinical Symptoms and Course.—The stage of incubation of distemper is generally from four to seven days. In rare cases it may linger, for eight to twelve days, after contact with the diseased animal, and Krajewski states that cases of infection through cohabitation may sometimes take from two to two and a half weeks to develop. The first actual symptom is an increase of temperature. In the initial stage it rises to 40°, and in some cases 41° and over. An increase in temperature has been observed by the writer in all cases of distemper, when the examination was made early in the disease. Later on the temperature falls slightly, but in some cases very rapidly, and it may even go below the normal point, according to the individuality of the anmial, and to the intensity of the attack. Very mild cases have little or no elevation of temperature, but as a rule there is a regular increase and decrease of temperature, as the disease runs its course. In fatal cases toward the end the temperature is invariably subnormal. In cases developed by inoculation we occasionally find a marked increase in temperature. The next symptom is the disturbance of the general condition. The animal is depressed, restless, has little or no appetite, seeks the heat, becomes easily fatigued, is chilly and shivering, the nose is hot and dry, the skin is inelastic, and the hair becomes harsh and dry, the animal refuses to play or to go out for a walk, lies most of the time and gets into dark places. In some instances vomiting occurs, but can hardly be called a characteristic, initital symptom of the disease. This stage of the disease is short, from 24 to 48 hours; the symptoms increase rapidly, and develop the four characteristic forms, which are as follows:

1. Catarrhal distemper (eyes and nose and lungs), muco-purulent discharge of the nose and eyes, cough, which is very persistent and may be so severe as to cause great depression or vomiting, more or less increase of respiration, which in some cases may be labored.

2. Gastric distemper (intestinal distemper), coated tongue, loss of appetite, thirst, vomiting mucous in thick tenacious masses, diarrhœa, yellow in color and fæces that are muco-purulent, and may even contain blood.

3. Nervous distemper (irritation of the brain and spinal cord). Fear, uneasiness, great irritability, dulness or sleepiness, twitching of the muscles of mastication, or epileptiform convulsions, chorea and complete paralysis.

4. Exanthematical distemper (distemper pustula, dog pox), pustules on the abdomen and internal surface of thigh.

Without reference to the above classification the following phenomena of distemper may appear during the course of the disease:

1. **Symptoms on the External Membranes.**—These appear in about one-half of cases and are of great importance in diagnosis. We see a

number of small red spots upon the inner fascia of the thighs, the abdomen and, in rare instances, the mouth and eyes, on the internal surface of the ear flap or even on the vestibule, and still more rarely covering the entire body. They are generally scattered, very rarely confluent. They rapidly form small bladder-like blisters filled with serum, and later on this serum changes to pus. They are about the size of a lentil or small bean, and soon dry up, forming yellowish scabs and crusts. When the eruption is very extensive, the animal gives off a very unpleasant odor from the affected parts. These pustules are rarely itchy, and if so, it is only to a very slight degree. After these scabs fall off (generally in about one week), they leave a red circular spot on the skin which disappears slowly. In other cases we find more or less depth to the cicatrix, leaving pit-like ulcerations. They are probably due to the animal scratching or gnawing the sore. In rare cases the rash has appeared on the lips, extended over on the mucous membrane and caused extensive ulcerative processes of the mouth or it may spread all over the body and in occasional cases it is found in the prepuce causing purulent catarrh of that organ. This is the only skin eruption that characterizes this disease and it dries up very quickly, so that in from eight to fourteen days we see no other marks except those light, granulating spots (exanthema of distemper, distemper pox). Hertwig and Friedberger have observed some cases in which this eruption made its appearance without any other symptom of distemper.

2. Symptoms Indicated by the Eyes.—There is generally more or less purulent catarrhal conjunctivitis. The animal avoids the light. There is redness and swelling of the conjunctiva. In the early stages the secretion is serous and very fluid. Later on it becomes a muco-purulent secretion, either light gray or yellowish in color. This sometimes occurs in large masses (blennorrhœa of the eyes). This fluid collects in the corner of the lower eyelid or trickles down over the face, drying in yellowish crusts in the edges and borders of the eyelids, frequently gluing them together. The corrosive action of these secretions, and also the inflammation of the surrounding membranes, may cause lesions of the cornea, sometimes from the animal scratching and rubbing the eye, especially in animals with prominent eyes (such as pugs and King Charles spaniels). In some cases it may be due to deficient nutrition of the cornea. This ulceration starts with a slight swelling on the external surface of the cornea and the subsequent formation of an ulceration. (Other details will be found in the chapter on Diseases of the Eye).

We see cases where there is a deep pericorneal injection of the cornea, (keratitis parenchymatosa), in which a blue grey, blue white, or milky white opacity commences at the outside edge of the cornea and spreads over its entire surface. It may affect one or both eyes at the same time, and the opacity may disappear leaving no trace or it may go away slowly and in rare cases leave permanent white star-like spots on the surface of the cornea. In rare cases keratitis parenchymatosa and some fever may be the only symptoms observed during the course of the disease The ulcerations are apt to appear in the middle or most prominent part of the cornea, and penetrate into the corneal tissue, and the pit-like depression on the cornea may become vascular, and it may also perforate the cornea, evacuate the contents of the anterior chamber, cause prolapse of the iris, and formation of staphyloma. Loss of the eye, by purulent panophthalmitis, is very rare, the eye clearing up and leaving more or less pigmentation of the cornea. Diseases of the interior of the eye, by extension of the inflammation of the cornea, are very rare in distemper. This may be complicated with a permanent opacity of the sclerotic membrane, and in rare cases the whole eye becomes acutely inflamed and breaks down (see Diseases of the Eye).

3. **Symptoms of the Respiratory Apparatus.**—These are generally a catarrhal inflammation of the mucous membranes of the upper air passages, and, if the disease is acute, the finer sections of the bronchi become inflamed. The first symptom is a catarrh of the nose, which is marked by sneezing and the animal rubbing or wiping his nose with his front paws. This discharge increases. In the early stages it is simply serous; later it becomes mucous, grayish-white or grayish-yellow, sometimes bloody, and in some cases even purulent, with more or less odor. We also see a "sniffling" respiration. This is particularly noticeable in short-headed dogs (such as pugs or bulldogs). In all cases there is catarrh of the larynx, and bronchioles. Catarrh of the larynx is generally marked by a loud, hoarse, dry cough, which is particularly distressing to the animal, especially at night. As the disease advances it becomes moist and looser, and is easily produced by a slight pressure on the larynx. Where there is simple laryngitis, we do not generally see any visible increase or difficulty in respiration. This is changed, however, as soon as the large bronchial tubes become involved. In such cases we see a marked increase in respiration, which gradually becomes more intense as the inflammatory process goes downward into the finer bronchi. Any pressure on the sides or tapping upon the walls of the chest causes a very distinct, painful, distressing cough. On auscultation we hear an increased vesicular breathing, as well as dry and moist rattling bruits, which are of various forms and intensity.

If the inflammatory process has extended to the fine bronchi it is not rare to see the formation of lobular pneumonic centres—that is to say, catarrhal pneumonia. Difficulty in respiration now appears more pronounced; respiration is superficial but laborious, as is proved by the inflation of the cheeks. The number of respirations may increase from 60 to 80 or even more. The cough is very painful, dull, and weak; the pulse is greatly increased, and the temperature may increase to a marked degree, but it is remittent. On auscultating we hear in the lungs, snoring, groaning, and wheezing sounds and rattling bruits (these last are moist and numerous), also more or less blowing sounds in different regions. We notice an increased vesicular respiration with sharp, prolonged, expiratory bruits, of a mixed character. In the same region we may notice bronchial respiration. Percussion, as a rule, is not very instructive.

4. **Symptoms of the Digestive Tract.**—The chief of these is catarrh of the stomach, which may vary in intensity. There is entire loss of appetite, vomiting of a thin, frothy, turbid liquid which is shiny or muco-purulent. There are frequent discharges from the bowels of a thin, mucopurulent fluid, occasionally streaked with blood, and always accompanied by a painful tenesmus. We may also find the abdomen very painful on pressure, and, as a rule, contracted and tense. Yellow coloration of the visible mucous membranes (icterus) is occasionally observed.

5. **Symptoms of the Nervous System.**—The animal is very dull, especially its senses. There is a marked apathy and depression, and in some cases deep coma. In a great many cases this condition may be accompanied by periods of excitement, nervousness, great restlessness, and even true delirium. These periods, which might possibly be mistaken for rabies, are not of any great length, as a rule, the animal sooner or later showing signs of marked depression. Motor disturbances, such as twitching of various groups of muscles, mostly the head and extremities, are noticed, and, in some cases, convulsions or true eclamptic attacks. These follow one another at long intervals, or keep the animal irritated for days. Clonic convulsions of the maxillary muscles are very frequently seen. They consist of a rapid and regular twitching of the muscles of the lower jaw, sometimes confined only to chattering of the teeth, and occasionally sufficiently strong to make a foam of the saliva. Besides this, we may see symptoms of motor paralysis. The patients are unsteady and irregular in their actions. In some instances they drag their hind legs, or occasionally their posterior extremities lose their power and the animal is unable to stand; in rare instances, due to paralysis of the sympathetic, the bladder and the lower bowel lose the power of their sphincters and urine and fæces are evacuated involuntarily.

Other General Symptoms.—As has already been observed, the temperature may rise or fall, and follow an irregular course, and it is apt to be subnormal in the majority of fatal cases. When bronchitis increases in intensity and a catarrhal pneumonia develops, it is apt to be accompanied by considerable increase in temperature. In some cases, due to parenchymatous degeneration of the cardiac muscle, the pulse is small, thready and irregular. The urine frequently contains more or less bile coloring matter, sometimes albumin and tube casts are found. In some cases the general nutrition and condition may keep up well all during the disease and in other cases the animal at the onset of the disease rapidly loses his vital force, even when it is eating a fair amount of nutriment, goes down in strength each day. Frequently the expired air has a particularly unpleasant penetrating odor.

The anatomical alterations of the nervous system, produced by this disease, which are shown in the section of the brain, are sometimes very slight, and it is rather remarkable to find such acute nervous symptoms with so little pathological alterations. The microscopical examination shows little change, or few alterations you might expect from many of the infectious diseases of other animals. We must, therefore, admit that the microbes of distemper are not as yet well known. Like all other pathogenic micro organisms, they produce "ptomaines." It has been proven that the severity of the nervous symptoms depends to a certain extent upon the natural disposition of the animals, and also their bodily health. When they take the disease, as weak, anæmic, poorly fed animals, they are very apt to be severely attacked with a nervous form of the disease. Occasionally symptoms appear in this disease which should be mentioned, such as serious weakness of the heart. This may be due to a parenchymatous degeneration of the heart muscle. It is generally fatal, as it produces œdema of the lungs. Albuminuria is produced by parenchymatous degeneration of the kidneys, and in rare instances from true nephritis; decubitus is seen occasionally in severe cases in the elbow- and knee-joints, also at the femoro-tibial articulation. This sometimes causes septicæmia and produces death.

The large number of the above-described symptoms show how completely the whole body may be affected with this disease; generally, however, the gastri-catarrhal forms predominate and run a regular course. We also observe in some instances peculiarities and symptoms which may, to a large extent, come from a general want of nutrition, or want of resistance in some cases, while in others, especially in the terrier classes, they seem to be able to throw off the disease and stand more acute attacks than other animals. There are some forms of the disease which are so mild in character as to almost escape observation. Thus we may have a mild exanthema or a slight respiratory or intestinal catarrh which may be difficult to recognize. The duration of this mild form of the disease may be from half to one week. Of the different forms of the disease the catarrhal and gastric forms are most frequently seen, the nervous next, and the exanthema least.

Course and Prognosis.—Distemper generally runs its course in two or three weeks, although we occasionally see cases where the disease is, as we have just stated, particularly mild which runs its course in one week to a week and a half, and in severe cases is prolonged for a much longer period. In such cases this prolongation is not due to the influence of the disease directly, but rather to secondary complications. We may count among these, certain nervous diseases which frequently remain or appear after the disease has run its course. For instance, paralysis of some of the muscles, of the hind-quarters, or of all the extremities, and rhythmic movements resembling St. Vitus's dance in some of the muscular groups, especially the muscles of the face or of the legs, and is indicated by a constant twitching, clonic in character, sometimes severer at one time than another, but more especially after excitement. Blindness, loss of sense of smell, or bark may also result from alteration of the nerves; or the animal becomes an idiot, has hallucinations (thirion), difficulty in respiration, persistent anæmia, and a chronic catarrh. Amaurosis and deafness may occur in some cases. The course of distemper, as might be inferred from the foregoing, is quite variable. The same is true of its duration. Mild cases may terminate in recovery in one or two weeks while the more severe forms require three or four weeks. In some cases the disease drags on interminably or the patient remains permanently afflicted with muscular paralysis, jerky movements, convulsions, deafness, blindness, loss of voice or sense of smell, weakmindedness, shortness of breath, heart disease, kidney disease and catarrhal affections. Death usually results from paralysis of the brain or pulmonary edema, rarely septicemia or general exhaustion. The mortality ranges from 10 to 20% except in large kennels where it may exceed 60%. Even in the apparently mildest forms the prognosis should be made with caution because it is a characteristic of this disease that a turn for the worse may come at the most unexpected moment. Cases that are accompanied by pronounced nervous symptoms, pneumonia, or catarrh of the lungs are to be regarded as most serious. Continued high temperature, great cardiac weakness, subnormal temperature and profuse diarrhea are unfavorable symptoms. Very young dogs, those improperly nourished, anemic, rachitic and inbred animals and those that have been exposed to cold suffer more and show a higher mortality than others.

Pathological Anatomy.—The most prominent and constant anatomical alterations found at post-mortem are those in the respiratory and digestive organs. In the former there are all the phenomena of an acute catarrhal inflammation of the larynx, trachea and bronchi, and also of lobular pneumonia and catarrhal inflammation of the stomach and intestines. For details, see under their respective chapters.

We find also more or less pathological alteration in the central nervous system, such as hyperæmia and small hemorrhages in the coverings of the brain; œdema of the brain is sometimes present with flattening of the convolutions and serous infiltration into the subarachnoids. In the ventricles and base of the skull we have more or less marked venous hyperæmia. As a rule, the spinal cord shows nothing abnormal except that it is pale and seems soft in consistence.

Under the miscroscope decided changes have been noticed in the brain. Kolesnikoff detected an infiltration of brain-matter and walls of the brain vessels with lymphoid cells as well as a distention of the capillaries and smaller arteries. These were filled with red and white blood corpuscles. In the infiltrated walls of the vessels of the brain were found dark-colored, homogeneous granulations and accumulations. Krajewski found also the perivascular spaces and the ganglionic cells filled with lymphoid corpuscles, and he mentions particularly that those cases had died without showing any prominent nervous symptoms. Muzulewitsch found inflammation of the spinal cord in acute nervous distemper, in which there was marked hyperæmia. He also found alterations in the walls of the vessels, and an albuminous exudation in the upper third part of the spinal cord along the blood vessels, as well as in the interstitial tissue of the gray substance. As a sequence of the acute nervous form we have a chronic interstitial myelitis with partial atrophy of the spinal cord.

Carougeau found an infiltration of leucocytes in the gray matter of the entire cord, particularly in the anterior horns, a myelitis disseminate which he believes was originated by the toxic action of distemper contagiosum; this observation was made on a dog affected with chorea as a sequence of distemper. Bohl and Rexter have reached the same conclusion from their observations of the central nervous systems of dogs affected with distemper.

More important than the above are the peculiar structures, found by Sinigaglia and others, in various parts of the brain and spinal cord as well as in the epethelial cells of the bronchi and the conjunctiva. Sanfelice found them also in many other regions of the body. These structures are found enclosed in the cells referred to (one to three in a cell), take a red stain by the Mann method (similar to the Negri bodies of rabies) but the vacuoles in the interior of these bodies takes a lighter red stain. Sinigaglia regards these structures which he calls **Negria canis** as causative agents in the development of distemper. It is probable, however, that they are not protozoa (Chlamydozoa) but rather **reaction products** due to the irritating effects of the unknown cause.

Lentz found similar structures in the degenerated ganglia cells and adjacent intercellular space and called them **distemper bodies.** Standfuss made the same observation. Lentz explains these structures by assuming them to be chromatin masses of the degenerated cell protoplasm and nucleus.

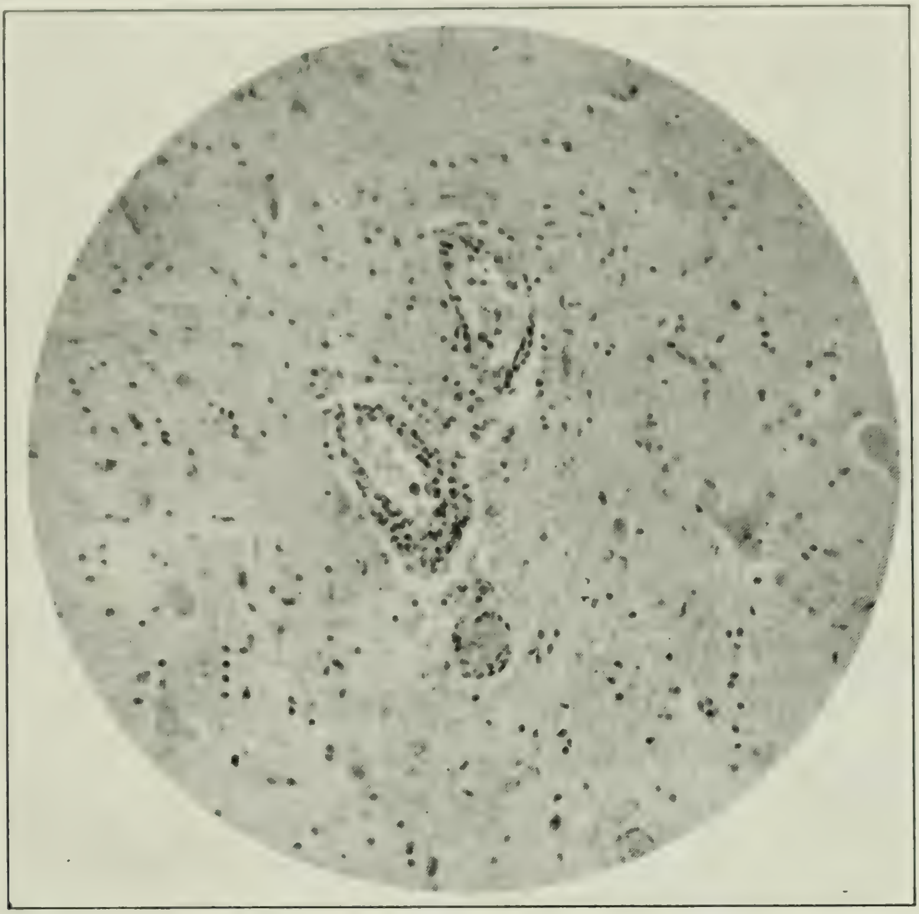


Fig. 136.—Canine distemper. Section of the spinal cord, showing inflammation of gray matter. (*Roman and Lapp, Journal of A. V. of A.*)

Other abnormal conditions are found in distemper, such as anæmia, parenchymatous or fatty degeneration of the heart, liver, kidneys, and an abnormal swelling of the lymphatic glands of the thoracic and abdominal cavities and changes in the skin and eyes.

Prophylaxis.—The animal affected with the disease should be kept away from all animals that have not already had the disease, particularly young animals; strict disinfection of the kennels or sleeping places of the affected animals and also the various articles used by them. Preventive vaccination, while it cannot be called a success, is worth consideration. Dogs that are not too highly bred, but bred on rational lines, and are well kept and substantially fed, are better able to stand the disease and, after it has run its course, come out of it stronger and make quick recoveries; it cannot be said, however, that in this disease this always holds good, for frequently an animal that is in perfect health and fine physical condition may contract the disease and die, and another animal in not nearly so good condition throws off the disease and makes a very quick and prompt recovery.

Therapeutics.—No specific therapeutic treatment can be given for distemper—that is, no agent has been found up to this time which has the property of destroying or rendering harmless the specific micro-organisms present in this disease. Certain antiseptic and antibacterial remedies, like quinine, salicylic acid, antipyrine, etc., may generally reduce the fever, but they produce no influence on the general course of the disease. The use of agents for reducing the temperature is objectionable, as they not only deprive us of the symptom of temperature, which is of the greatest importance during the course of the disease, but cause more or less depression of the heart. According to Frohner's experiments, calomel is supposed to have a slight claim as a universal agent, but this is on the same order as black coffee, which was formerly advocated by Trasbot. Common salt has been recommended by Zippelius, and ergotin was highly recommended and frequently used a few years ago. None of these remedies, while they prove beneficial in some cases, is to be laid down as a specific for the treatment of the disease, therefore we must continue to treat it in a purely symptomatic manner. Antipyrine, which was advocated as an absolute specific, does not in the least deserve this recommendation. The diet must be easily digested food, but at the same time as nutritious as possible. Milk, bouillon, soup, and scraped raw meat (which is generally taken with a relish) have much to commend them. In grave cases where there is entire loss of appetite, we must use concentrated food, such as peptonized meat, extract of beef, and clear broth. This may be given with some mild alcoholic stimulant, wine, etc. There are some forms of extract of beef which are not to be recommended, on account of their slight nutritive value and as they also contain a large proportion of sodium salts. When the temperature rises above 40° we must try to reduce it by means of frictions of alcohol and mild antiseptics. The writer, as a rule, does not advise the use of quinine on account of its action upon the heart.

It must be said, however, that in this disease good nursing, attention to dietetics, fresh air and cleanliness are the greatest factors in producing good results. The animal must be kept in a dry, clean, warm (not hot) well lighted and ventilated kennel, but avoid the slightest suspicion of a draught or dampness, and to prevent the spread of the disease through contagion, disinfect the place when the animal has recovered, as well as the surroundings used by the animal from time to time. The food should be substantial and easily digested, such as milk, sago, egg and milk, mutton broth and eggs, thick soups and small quantities of raw meat must be given at short intervals.

When the animal refuses to eat, he must be given food in concentrated form, such as thick meat broth, with a yolk of egg in it, extract of meat, extract of malt, hæmatogene, hæmo-albumen, or use some of the various extracts of beef.

To maintain the strength, or when the acute symptoms have subsided but the animal is weak, the digestion poor, or the mouth sore and solid particles of food cannot be eaten, we use concentrated food, such as some of the various meat extracts and peptonized products, commercial meat juice and liquefied peptone; nutritive preparations containing albumen, such as samatose, plasmon, etc. If the stomach cannot retain food but is vomited up immediately after it is given, nutrition can be administered by means of clysters. This can be meat broth, yolks of egg, and thick starch water, to make it of enough consistency to be retained in the rectum. Very frequently by this means an animal can be carried over the grave stages of the disease, and it is surprising how long an animal's life can be sustained by this means. Albrecht mentions one dog that had chronic nephritis, and was nourished for forty-two days by this means. In the administration of a nutritive clyster, the rectum must be first cleansed by an injection of luke-warm water, and in about ten minutes, not sooner, the nourishing clyster is given; the amount varies from a tablespoonful to a cupful, according to the size of the animal. The injection must be made slowly and carefully, care being taken not to excite the animal any more than is necessary, and when the nozzle of the injection pipe is withdrawn the anal opening must be held closed for a short time, and, if possible, elevate the hind quarters of the animal.

The following nutritive clysters are recommended:

1. Two or three beaten up eggs, 250.0 thick bouillon.

2. Two beaten up eggs, 200.0 concentrated bouillon and a spoonful of starch.

3. Two beaten eggs, 10.0 peptonoids, 120.0 sherry wine, 250.0 bouillon.

4. One beaten egg, 600.0 bouillon, 150.0 port wine, 0.5 bicarbonate of soda, 0.02 common salt, and 60.0 peptonoids.

5. Two beaten eggs, 4.0 salt, 20.0 port wine, 250.0 milk.

6. Two or three eggs beaten up with a little cold water, and a pinch of starch; these are laid to one side, then a tablespoonful of sugar, a half cup of milk and a wineglassful of port wine are mixed together and boiled for a short time, when it is allowed to cool. When it is nearly cold add the combination to it with a small pinch of salt, care being taken to see that the solution is not warm enough to coagulate the milk. (Ewald.)

7. Add 4 to 6 eggs to a mixture composed of 1.2 hydrochloric acid, 220 water and 3.0 to 5.0 of pepsin, let digest at 40 degrees C. for 10 hours, then remove to a cool place for a period of 6 hours.

8. Add three parts of finely scraped beef and 1 to 2 parts of finely chopped fresh pancreas (ox, calf or hog) to three parts of lukewarm water with a little salt and stir into a gruel. (Leube.)

9. Dissolve 25.0 peptonum siccum in 100.0 hot water.

10. Water 100.0, grape sugar 15.0, Calodal (egg alubumen preparation).

Instead of these nutritive clysters subcutaneous injections may be tried with grape sugar solution, olive oil (10.0 to 20.0 per dose) or calodal. The latter is prepared by dissolving 5.0 in 50.0 of water, sterilized by boiling, mixed with 500.0 physiological salt solution and injected, by degrees, into subcutaneous areas.

In the early stages of the disease, the stomach can be emptied by means of an emetic, such as the subcutaneous injections of apomorphia, antimonial wine, etc. It is a question whether an emetic by its subsequent depression does not do more harm than good. As a rule, constipation is not present and the bowels had better be left alone; if the animal commences to eat and the intestinal canal returns to its normal condition, the lower bowel will be emptied naturally without the assistance of drugs; if, however, it is necessary to evacuate the rectum, use a glycerine suppository, or give castor oil. Compressed yeast may be used as a mild laxative. At all events it would do little harm. Fever may be combatted with antipyrin, antifebrin, aspirin, lactophenin, etc. Slight fever or the fever of the initial stage requires no therapeutic interference.

Lactophenin 0.25——1.00
D. T. D. Nro. VI.
Sig.—One powder three times a day until temperature goes to normal.

If the respiratory tract is affected and the morbid process limited to the nose and larynx vapors or atomized fluids may be administered. Laryngitis, bronchitis or pneumonia may be treated with Priessnitz bandages over the affected region. This may, under certain conditions be preceded with application of mustard liniment. Internally, the remedies indicated are those seen under Catarrh of the Intestine. Senega syrup (teaspoonful to tablespoonful doses) and syrup of ipecac (teaspoonful doses) are very effective. Coughing may be allayed with morphin or codein. See treatment of catarrhal affections of the larynx, lungs, and pneumonia.

If violent diarrhea exists, administer remedies discussed on page 98. The following, also, may be substituted:

Tinc. Opii simpl.	10.0
Macerat. Sem. Lini	150.0

M. D. S.—One-half to one tablespoonful every three hours.

Decoct. Rad. Ratanhiae	15.0:150.0
Syrup Aurant. Cort.	30.0

M. D. S.—Tablespoonful every two hours.

Tanopin	10.0
Vin. rubr.	120.0

M. D. S.—One-half to one tablespoonful every fifteen minutes till effective. Shake before using.

Gallogen	0.5——2.0

D. S.—One or two such powders daily until effective. (Kuennemann.)

Points brought out under the discussion of Intestinal catarrh should be taken into consideration.

To stimulate appetite, the various bitter tinctures and wines, e. g., Tinc. Rhei vinosa, Tinctura Aurantii, Tinctura Chinae composita, Vinum Chinae, Vinum condurango are serviceable. Hydrochloric acid and wine of pepsin may be useful. Violent vomiting or other symptoms of gastric irritation should be treated according to methods given under Catarrh of Stomach.

Alarming weakness may be combatted with repeated doses of black coffee, coffee and brandy, strong wine, wine of camphor (teaspoon to tablespoonful doses) or, if indicated, subcutaneous injections of spirits of camphor (one or several C.C.), ether, caffein-natrium salycylicum (0.05 to 0.5), atropin (0.005 to 0.02), scopolamin (0.003 to 0.01). Subcutaneous injections of physiological salt solution or other artificial sera have been recommended (30 to 50 C.C. or more).

The same remedies are recommended for marked nervous depression, apathy and somnolency. Marked excitement, restlessness, spasms, cramps, should be counteracted with absolute rest, darkened quarters, bromides, morphin, sulfonol, trional, veronal, luminal and chloral hydrate. For further instruction read articles under tik and paraplegia.

Natr. Bromat.	10.0
Aq. Dest.	100.0

M. D. S.—Teaspoonful to tablespoonful two or three times a day.

Sulfonal	1.0

Dt. d. Nr. VI.
S.—One or two powders a day in milk.

Conjunctivitis. In the beginning stages, while there is still irritation, warm applications of creolin, lysol or boracic acid solutions. Later on astringents, e. g., solutions of sulphate of zinc sulphate of copper or sulphate of aluminum, may be used.

Zinc. sulfuric.	0.5
Acid boric	2.0
Aq. Foenicul.	80.0

M. D. S.—Eyewater.

Cupr. aluminat.	0.5
Aq. Dest.	50.0 to 75.0

M. D. S.—Eyewater.

In obstinate cases treatment of the conjunctiva with nitrate of silver solution (1 to 2%) are effective. This solution must be applied with care (camel's hair brush) and immediately followed with wash of weak sodium chlorid solution.

Itching, which is frequently a serious accompaniment of catarrhal conditions of this character (conjunctiva) on account of rubbing and scratching of the patient, is relieved by frequent applications of a few drops of a 2 to 4% solution of cocain. One per cent solutions of Acoin or of acoin oil are also effective. However, patients thus affected should be constantly watched or otherwise suitably protected with proper appliances. (See more detailed information under Conjunctivitis.)

Cocain hydrochloric	**0.5**
Aqua. Desttillat.	**20.0**

M. D. S.—Eye drops.

Sol. Acoin bas. oleos. (von Heyden)	**5.0**

Original package.
S.—1 per cent Acoin oil.

If there is a distinctly purulent discharge from the eyes, nitrate of silver may also be used but the author prefers (from experience) applications of luke warm solutions of creolin, lysol, or boracic acid or Itrol solution (Itrol 0.1, Aqua. Dest. 400.0).

These treatments should be repeated several times a day and the conjunctival sacs should be carefully irrigated to remove accumulations of pus. To protect the eyelids and prevent their adhering, use vaselin or boracic acid ointment. Other complications liable to appear on the conjunctiva and ulcers of the cornea, etc., are discussed in the chapter on Diseases of the Eye.

Parenchymatous keratitis is usually treated with applications of a few drops of atropin solution (1 to 100 or 200), and warm moist applications. After the inflammatory symptoms have subsided, calomel, precipitate ointment and massage are indicated.

As a rule no special treatment is required for the skin eruptions. However, the affected regions may be treated with powdered starch, talcum or salicylicous cum talco.

Extreme caution should be exercised to avoid baths on account of the danger of "catching cold."

Other therapeutic measures will have to be employed as the symptoms arise, and we would refer you to the diseases of the nose, larynx, bronchia, and air-passages, also to those of the stomach and intestine, particularly where there is persistent diarrhœa, and lastly diseases of the brain, spinal cord, and eyes. As a rule, no treatment should be used for the skin eruption in distemper. If any irregularity arise, however, this may be treated according to the methods recommended under Diseases of the Skin.

Prophylaxis. This includes isolation of diseased animals, quarantine and observation of newly acquired dogs, avoiding dog shows, special dog compartments in railway cars, used crates, public training quarters and public dog baths; preventing young dogs from running about promiscuously or associating with their kind; thorough disinfection of quarters previously occupied by infected dogs and of instruments and implements that have been in contact with them. Since dogs that have been rationally bred, trained and nourished withstand the disease more successfully and make a better recovery, due attention should be given to these points. As to preventive vaccination, the various distemper sera that have been recommended for this purpose, are too frequently disappointing in their results, the immunity produced being of short duration, uncertain, or the vaccination being without any effect whatever. Ferry, Torry, and others state that subcutaneous injections of small quantities of Bacillus bronchisepticus will produce immunity. Eigen produced a serum that he considered effective by immunizing goats, dogs, colts and calves with the blood of infected dogs.

The **curative effect** of these and similar sera is not sufficiently pronounced to make them worthy of the name of **specifics.** The nervous symptoms of the disease in particular are not influenced by these sera. Similarly, the severe pulmonary and gastric forms are rarely benefited. Normal horse serum, recommended by Malzew and others, while well tolerated in large subcutaneous doses has been shown by the control experiments of Heinichen, Schautyr and others to be of little or no value. The same may be said of Behring's diphtheria serum as brought out by the subsequent experiments of Boden, Berndt, and others.

Other substances to which specific properties as curative agents have been ascribed are as follows: **Gurmin** (horse distemper serum)—ineffective. **Yeast** and **yeast preparations**—are bowel regulators, but no more.

Calomel—indicated in the first stages of gastric distemper. **Creolin inhalations**—of benefit in bronchial and pulmonary forms. **Iodin trichlorid**—injected subcutaneously in doses of 3 to 5 cc. of a one to two per mil solution—beneficial in the early stages of the disease. **Ichthargan**—3% solution, teaspoonful to tablespoonful doses, may be of value where digestive symptoms predominate. **Iodipin, Tallianin** (1 to 5 cc.) intravenously, **Argentum colloidale** (as an ointment applied to the abdomen) or in one per cent. solution intravenously or 2 per cent. solution per rectum, **Formol** solution (0.05% intravenous), physiological salt solution or other artificial sera—subcutaneously. **Arsenic preparations, e. g. salvarsan,** dose (ac. to Kroecher) 0.01 to 0.025 per kilogram (2 lbs.) body weight (tolerated in dilutions of 0.1 to 25 or 40, but is ineffective and may even aggravate the disease. **Levico-arsenical-iron** water has been recommended for nervous distemper but acts merely as a tonic. Serial injections of **sodium cacodylate** have been recommended. Nucleic acid has been credited with prophylactic virtues. **Parathyreoidin** 2 or three doses of 20 to 30 drops each—in water, **fixation abscesses** of possible value in pulmonary forms, **Vaccineurin** recommended by Herbig; **Trypan blue** recommended for injection in 1% solution in catarrhal and nervous distemper; **Kynodal, Ergotropin** (Serum plus bacterial albumin), and so on, indefinitely. Not one of the above mentioned so-called remedies have stood the test of continued use.

Infectious Bronchial Catarrh.

(*False or Bench-show Distemper.*)

Within the last twenty years bench shows have become very numerous, and kennels both large and small are legion, and from each kennel one to ten or more of the dogs are being exhibited from time to time, we frequently observe in these kennels shortly after dogs return from the shows a disease that resembles and is frequently taken for distemper. This disease for a better name has been called "Bench-show Distemper." It is decidedly infectious and attacks the large bronchi producing catarrhal bronchitis and a muco-purulent discharge from the nostrils and eyes; with this there is also catarrh of the intestines. The writer has also felt that there may possibly be such a condition, and has intimated that fact under the head of Catarrh of the Bronchia.

Etiology.—It is generally seen in large kennels, attacking one animal after another or several at once. It may also be observed where several dogs have been sent to a bench show, developing shortly after they return. The period of incubation is three to five days. Another peculiarity is that one attack does not insure immunity from another. The writer has observed several dogs that have developed this disease, and the next year repeated the attack after returning from a show.

Pathological Anatomy.—The lesions found are very similar to those of true distemper, but milder in character. The alterations in the lungs are those of catarrhal pneumonia. The most frequent condition observed is great irritation of the mucous membrane of the intestines, with more or less swelling of the whole intestinal tract. The follicles and glands of the intestines may be swollen or enlarged, and in rare instances ulcerated, but not to the marked degree seen in distemper.

Clinical Symptoms.—The animal is dull and listless for two days, when the temperature will be found to be 39° or 40°; slight running from the eyes; and invariably diarrhœa. This last symptom is generally observed from the first, the stools being liquid the first few days, and later filled with gelatinous mucus. At the end of a week there way be some passed in the stools, but this is not commonly seen.

The appetite may be very poor or even lost, but generally in three or four days the animal will commence to eat, but stop again if the diarrhœa should be severe, or eat very small quantities. Vomiting is rarely seen except at the onset.

The discharge from the nose and eyes is difficult to distinguish from distemper, except that it is thinner and muco-purulent. The cough is stronger, and not the soft, shallow cough observed in distemper. Frequently we find acute laryngitis or bronchitis. The exanthema of distemper is absent but the hair is dry and harsh, and frequently the hair falls out very rapidly in the long-coated dogs, especially collies.

The mouth very frequently becomes sore and the gums may ulcerate. In rare cases a series of aphthous ulcers are seen on the lips and around the free end of the tongue. This condition rarely causes death unless the diarrhœa is persistent and the animal will not eat; and any attempt at forced feeding is followed by vomiting.

In some cases shortly after the acute symptoms commence there may be evidences of congestion of the brain, accompanied by severe and continued convulsions, which frequently cause death.

The treatment is practically the same as in distemper. Keep the animals warm and dry, give easily digested food, lean meat, carefully removing all fat, and quinine, iron, and some of the pepsin preparations, and allow them to run if they are not too weak. Penning them up closely does harm.

℞. Ferri et quininae citras,	12.0
Elixir simplex,	96.0

S.—One teaspoonful three times daily.

If the diarrhœa is severe, give

℞. Bismuth subgallate,	0.75
F. charta No. xii.	
S.—One powder three times daily.	

Infectious Hemorrhagic Gastroenteritis.

(*Canine Typhus, Stuttgart Dog Disease, Dog Plague, Black Tongue.*)

This disease may be described as a grave infectious disease, having some of the characters of distemper. The characteristic lesion being an acute hemorrhagic inflammation of the intestinal mucous membrane and frequently accompanied by an ulcerative stomatitis. This disease attacks animals of all ages; occasionally a milder form is observed, indicated by severe pharyngitis and gastric catarrh and is differentiated from simple gastric catarrh by the more acute symptoms and the fact that it does not respond to the ordinary treatment used in simple catarrh.

The disease was described by Hoffer in 1850 as dog typhus; and during the latter portion of the nineteenth century it spread over the greater part of Europe and destroyed numbers of animals. Then the outbreak lessened in severity and only sporadic cases were observed, but recently it appears with increased severity. It made its appearance in America, particularly in the southern states, about 1887 and has been more or less epidemic ever since, some years it almost disappears and the next year it may break out again with the greatest severity; it attacks all breeds but particularly pointers and setters, we find solitary cases occasionally, where no possible means of infection can be traced.

Etiology.—The disease attacks animals of all ages, but seems to predominate in older animals. Sex, constitution and breed do not seem to hinder or have any bearing on the course or severity of the disease.

The actual cause of the disease or medium of infection has not been definitely described. Some observers think the fæces is the medium of the infection, some the urine, some the vomited material, others the urine, blood, or other tissue fluids, but the majority of observers agree that the disease gains entry into the system by means of the digestive tract. It is not definitely known if it is directly transmissible to another animal, and the direct inoculation of the disease is only accomplished with great difficulty and after repeated experiments, and even then it is governed by certain favorable circumstances. Albrecht injected a healthy dog with blood taken from an animal affected with the disease. Into a second dog he injected subcutaneously a certain amount of bile from the gall-bladder of another infected animal. Into the third animal he administered a quantity of the contents of the stomach of a diseased animal. The animal that had the subcutaneous injection of bile developed a severe abscess at the point of puncture and made a good recovery. The other animals were not affected at all. Scheibel fed finely cut up portions of the stomach and intestines of affected animals without any ill affects, but when he had given an animal a solution of bicarbonate of soda, rendering the mucous membrane of the stomach alkaline, the animal developed the disease two days later. Scheibel came to the conclusion that a mixed infection of the coli-bacteria and micrococci was more apt to reproduce the disease. Pirl found in the blood taken from the heart of the diseased animal an organism which was similar to the bacterium hemorrhagicum. Zschokke found in the serum of the kidneys of an animal that had just died numerous slender cocci-bacteria. The majority of French observers believe that the disease must be classed under the head of the pasteurellas. Bimis and Seris contend that this disease is simply a very malignant form of distemper. Hutyra obtained from the mucous glands of the mucous membrane of the intestine and from the intestinal contents virulent coli-bacilli. The intravenous injection of an experimental bouillon culture produced fatal hemorrhagic gastro-enteritis, whereas, if the stomach was previously neutralized, the bouillon could be fed to the animals and produce no effect whatever.

Pathological Anatomy.—Severe inflammatory alterations will be found along the digestive apparatus. The stomach is found to be be contracted to very small compass and rarely contains any food of any kind. The mucous membranes are swollen, red to black-red, containing more or less hemorrhagic spots and covered with a fœtid brown colored mucus which is alkaline in reaction. Similar changes but not so severe are found in the duodenum. The rest of the intestinal tract may be affected but it is the exception; the rectum, however, is frequently inflamed. The peritoneum is injected, the liver and kidneys are more or less hyperæmic. Zschokke found the kidneys presenting all the symptoms of metastatic suppurative nephritis. The bladder is usually distended and filled with urine, the mesenteric glands and spleen are generally slightly enlarged. The cavity of the mouth is ulcerated with necrotic processes in various places, particularly about the gums, and there are more or less inflammatory changes of the mouth and swelling of the tonsils.

Clinical Symptoms and Course.—The first symptom is a want of appetite, which is soon entirely lost, great depression and want of animation, frequent vomiting and great thirst. The vomited matter is at first streaked with bile but frequently it is brownish-red or the color of blood and in the latter stages the vomited matter is very fœtid, brownish in color. The animal defecates with difficulty, and if the temperature is taken the thermometer is found to be streaked with blood. After a few days the animal has a bloody diarrhœa with an intensely offensive odor. The urine is decreased in quantity and frequently the urine is passed with more or less difficulty. It is found on examination to contain albumin and bile coloring matter. The abdomen is drawn and tucked up and palpation of the abdomen, particularly in the region of the stomach, is very painful. The eyes are sunken deep in their sockets. The conjunctiva is intensely injected and in severe cases the congested conjunctiva is brownish-red and the pupils are fixed and dilated. There is more or less discharge of tenacious yellow mucus from the nostrils, the pulse is small and thready, and the heart has a full throbbing beat. The temperature is not particularly high, generally about 40 degrees; only in rare instances it rises above that and in cases of a fatal termination it is invariably subnormal. The mouth is frequently kept tightly shut by the animal and efforts made to open it cause the animal great pain. The mouth and breath have a particularly fœtid odor, particularly when the disease is well developed, and we find the gums and jaws and cheeks covered with deep ulcerous patches. The tongue varies; it may be brownish-red, bluish-gray, or extremely pale and on the upper surface of the tongue it is coated by dirty brownish-red mucus. Frequently the tongue lies on the floor of the mouth apparently paralyzed. In some cases the mouth, throat, and mucous membrane of the tongue are covered by sticky moist, purulent mucus and occasionally we find necrosis of the tip of the tongue. In some fatal cases we find little change in the mouth and pharynx other than deep redness of the mucous membranes.

When the disease goes on rapidly to a fatal termination, the animal becomes emaciated very rapidly, lies motionless in one position and dies within a week. In rare instances the animal may have convulsions before death. Mettel found pneumonia and hæmaturia and Richta found hemorrhage in the anterior chamber of the eye. If the disease lasts over ten days without fatal results, the mouth commences to clear up, the ulcers become covered with a brownish scab, the vomiting ceases, the appetite returns, and in two or three weeks the animal has fully recovered. Paralysis of the body and extremities may result, and deafness may occur as an after-result of this disease. In milder cases there are generally all the symptoms of acute gastric catarrh with pharyngitis. It is rather difficult in sporadic cases to diagnose between this disease and simple attacks of gastric catarrh and pharyngitis, but when we find a number of cases and where the odor from the mouth is particularly offensive and also the fæces, the chances are it is hemorrhagic gastro-enteritis.

The prognosis is very unfavorable. The mortality is from 50 to 70 per cent., and even the milder forms of the disease seem extremely hard to treat and frequently terminate fatally; young animals seem to be able to throw off the disease better than older animals, and young animals are much more apt to have a milder attack.

Therapeutics. Treatment in well developed cases is generally hopeless. Good care, nursing, regulation of the diet (see Distemper) keeping the patient in a warm place, free from draughts, etc., the following measures have been found of decided merit.

For gastro-enteritis—hot applications of linseed gruel or fango, irrigations of the colon (great care!) with decoctions of linseed, weak creolin solutions or solutions of tannic acid or alum (1—100) or physiological salt solution. Internally, the remedies given on page 86, of which the author recommends oil emulsion.

Other authors recommend: To allay vomiting, small pieces of ice internally, ice bags, creosote solution, morphin, iodin water, anaesthesin. For gastroenteritis, salicylic acid, salol, ichthargan (ichthargan, gum Arabic aa 1.5, aqua 50.0—teaspoonful at a time) or valerian, tincture of quinine, calomel, bismuth preparations, adrenilin solution.

The pathological conditions of the mouth cavity (and foul breath) are counteracted with peroxide of hydrogen, potassium permanganate, creolin water (1—100) followed in the later stages with the measures indicated on page 58.

Alarming symptoms of weakness are combated with camphor, caffein, atropin, scopolamin or intravenous injections of physiological salt solution. The author warns against the use of alcohol in this condition. Excessive, fetid diarrheas may be treated with tannoform, tannopin (small amounts up to a teaspoonful in peppermint—or camomile tea), also tannothymal or xeroform; for convulsions, or cramps, bromides and other sedatives. During convalescence, mucilaginous soups, milk, eggs, noodles; while meat should be given a little later.

SEPTIC AND PYÆMIC DISEASES.

Septicemia.

Etiology.—This disease is caused by staphylococci less frequently, or streptococci usually, and occasionally by b. coli and b. vulgare, proteus or micro-organisms related to them. The microbes may collect in a wound, enter through the mucous membrane, or they may accumulate in some centre in the body, later find their way into the blood and give rise to the characteristic symptoms of the disease, that is, high fever and great depression and these pus-forming organisms settle in the capillaries and form metastatic abscesses which appear in different organs of the body, and pyæmia when accompanied by the formation of abscesses and suppuration. It is termed septicæmia when there is high fever and general depression. It is extremely hard, however, to make a sharp distinction between the two, for undoubtedly the nature and intensity of the disease depends not only on the nature of the bacteria, but also on the toxicity of the same and the individual resistance of the animal affected.

This condition can originate from purulent, ichorous, or gangrenous wounds, ulcers, circumscribed or diffuse phlegmons, complicated fractures, decubitus, puerperal diseases, putrid abscesses of the stomach and intestines, acute inflammation and sloughing of the buccal cavity and pharynx, abscess of the prostate. In many cases the original cause cannot be discovered.

Clinical Symptoms.—Fever, ushered in by chills, high temperature—this may fluctuate and towards the end it may be subnormal—small accelerated pulse, great weakness of heart, livid red mucous membranes; in rare instances the mucous membranes are yellowish (icteric); sometimes hemorrhages of the mucous membrane and skin, great dulness and then complete prostration, no appetite, skin cold and inelastic. When the skin is drawn from the body it remains in position instead of flying back as healthy elastic skin will do; fœtid stools, albuminuria. As a rule death comes quickly. In less acute cases we find symptoms of nephritis, hepatitis, endocarditis, or evidences of localization of the condition in the formation of abscesses of the lungs, liver, or in the articulations.

Therapeutics. Where the port of infection has been recognized energetic antiseptic measures should be taken, operative when necessary.

The strength of the patient should be kept up by means of abundant and nourishing, easily digested foodstuffs. Low blood pressure is counteracted with camphor, caffein and, under certain conditions, suprarenin. Digitalis and strophanthus nearly always fail in keeping up the heart action in septic diseases. Antipyretics should be given, if at all, only when fever is excessive. To promote elimination of toxic substances from the body subcutaneous or intravenous infusions of physiological salt solution should be given at repeated intervals.

Among specific remedies, besides antistreptococcus serum, argentum colloidale merits argerol and similar albuminoid preparations of silver consideration. The latter remedy should be applied in part as an ointment on the skin of the abdomen and inner surface of the leg and in part intravenously (0.5% solution, 15 to 30 cc.), or 50 to 100 cc. of a 1 to 2 per cent solution per rectum. The results are doubtful. Finally, Incarbon (Merck) may be tried.

Prophylactically, the aseptic performance of all operations and the aseptic and otherwise proper treatment of all wounds or other pathological processes, are of prime importance.

Malignant Œdema.

(*Œdema Maligna.*)

This disease is extremely rare in the dog. It is an acute infectious disease caused by a specific bacterium (bacillus œdematis malignæ). It begins at a certain infected point in the form of a hot, painful œdematous, pitty swelling which afterwards becomes an emphysematous (crepitating) swelling which extends very rapidly into the surrounding tissues. This crepitation is peculiar to the disease, and can be separated from simple emphysema by the fact that in simple emphysema there is no fever present. Immediately after death the bacilli are found in the serum of the œdematous swellings and in the blood.

This Bacillus œdematis malignæ is not only found in animals but also in garden soil, dust, putrid organic materials, excrement of herbaceous animals, etc. It has been demonstrated recently that the œdema bacillus only develops when in combination with other bacilli such as the staphylococci, diplococci, etc.

The treatment of malignant œdema must be very energetic, as the disease causes death in a very short time. It consists in opening and breaking down the infected connecting tissues and thoroughly disinfecting them, first cleaning them out with peroxide of hydrogen, and then washing with hydrogen peroxide. Attending fever is treated according to general principles.

Anthrax.

(*Charbon. Malignant Pustule. Splenic Fever.*)

Anthrax is rare in the dog, and when it occurs it is generally caused by the animal eating portions of cadavers of animals that have had this affection. This is an acute infectious disease which is caused by the Bacillus anthracis, and is accompanied by high fever and local manifestations in the skin and mucous membranes. All forms of anthrax have been observed in the dog, but generally the seat of the disease is in the mouth, throat and in the intestines, and generally there is more or less tumefaction of the head. One observer saw a typical case of anthrax of the tongue and lips caused by an animal licking the blood of an animal that had that disease. Another case observed was where a terrier had eaten a bone of an animal affected with anthrax. Lüpke found on the inferior wall of the throat a carbuncle, which was probably caused by an erosion of the epithelium, in which there was great inflammatory œdema of the adjacent regions. In regard to the susceptibility of the dog to anthrax, one case is cited where 150 dogs ate the flesh of a horse that had died of anthrax; 100 had swelling of the lips, throat, forehead and head, and sixty of them died. Young dogs seem much more susceptible than older animals. Different breeds of dogs are said to be less susceptible to anthrax than others; this, however, is a question. When a number of animals are affected with symptoms of anthrax, particularly packs of hounds, when the dead cadaver is fed to the hounds, the proper method of diagnosis would be to examine the blood microscopically and make a trial inoculation of an animal that had not been near the infected animals.

Therapeutic treatment is generally useless on account of the rapid progress of the disease. If any treatment is attempted it may be in the line of the internal administration of antiseptics, creolin, carbolic acid, salicylic acid, and preparations of iodine particularly Donovan's solution. Where the carbuncle is formed then local incisions and the injection of corrosive sublimate solution, 1 to 1000, and tincture of iodine. The actual cautery has been recommended to destroy the tissue of the carbuncle. In addition to creolin, lysol, carbolic acid, creosote, salicylic acid, iodine, hydrochloric acid, formaldehyde, lagol's solution.—Intravenous injections of specific anthrax serum. Concerning sanitary laws, the following apply to this disease:

Animals which suffer from or are suspected of anthrax cannot be slaughtered for consumption.

Any operation that will cause bleeding of the animal suspected of anthrax can only be performed under the supervision of the official veterinarian.

All cadavers of animals which are affected or suspected of having anthrax must be rendered harmless by burning the cadavers. Skinning the animal is strictly forbidden.

Rabies, Lyssa, Hydrophobia.

This is an acute infectious disease peculiar to the canine race and may under ordinary conditions be transmitted to other animals and to man through the bite of an affected animal. With very rare exceptions, the disease has a fatal termination. The long period of incubation (8 days to several months) is characteristic of the disease.

Etiology. Rabies is a strictly infectious disease, never developing spontaneously, but always transmitted by infection and usually through the **bite** of an infected animal. It occurs chiefly among members of the canine race, dog, wolf, fox, jackal, etc., although many other species are suceptible, viz., cats, horses, mules, asses, cattle, sheep, goats, swine, Guinea pigs, rabbits, chickens, pigeons, as well as the deer, stag, badger, antelope, hyena, rat, mouse, marten, skunk, ape. Man is a frequent victim.

The disease is most commonly observed in the dog, in all quarters of the globe, irrespective of climate or geographic location, food, care, age or sex. Seasons only seem to have a certain influence, since more cases or outbreaks are observed in summer than in winter.

In Europe and in the United States the disease is more frequently observed in densely populated districts where dogs are numerous and in regions still inhabited by wolves (Vosges, Carpathians, Russia) and in large cities. In Germany 500 to 600 cases of rabies in dogs are recorded annually. Most of these occur in the Eastern Provinces (bordering on Russia and Austria) and a few in the western sections of the Empire. Very few cases occur in the interior.

The contagion consists of a fixed virus. It is propagated in the animal body only, never outside of the same. It occurs in the saliva, in the tissue of the salivary glands, in the secretions and in the tissues of the lachrymal glands, the mammary glands, the pancreas, the testes, the kidneys and suprarenal glands, in the ventricular fluid of the brain, occasionally in the blood, but especially and in most concentrated form in the tissue of the brain and spinal cord, finally, also in the peripheral nerves. It is notable that the virus may exist in these places in appreciable amount during the period of incubation, thus, e. g., in the saliva, where it may be demonstrated according to Roux and Nocard from 2 to 3 days before clinical symptoms appear; 2 to 5 days according to Nikolas, and 6 to 8 or even 13 days according to Konradi.

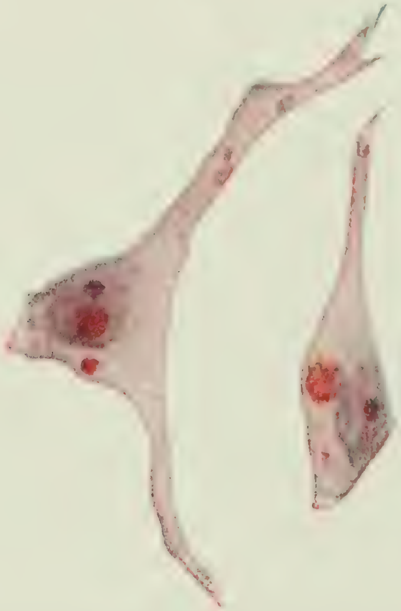


FIG. 137.—Ganglia cells with Negri bodies. Stain ac. to Mann. The Negri bodies are stained red. 1/12 oil im.; Ocular No. 3.

The exact nature of the virus has as yet not been definitely determined. It is very likely, however, that it belongs to the group of filterable, ultramicroscopic organisms as is indicated by the fact that brain emulsions, passed through Berkefeld filters, produce positive infections. Negri, in 1903, called attention to round and oval bodies, ranging in size from one to 27 micra in diameter, which he found in the nerve cells of certain portions of the central nervous system, especially in the horns of Ammon, the Purkinje cells of the cerebellum, the pons, medulla oblongata and cortex of the brain. These bodies could be demonstrated in dogs affected with either street rabies or inoculation rabies as well as in other rabid animals and in man. These bodies are readily stained by Mann's method (Methylene blue—Fuchsin).

They retain their characteristics even when the cadaver was in a state of advanced putrefaction and remain perfect in glycerine. Negri regards these as the various stages of evolution of a parasite which should be classed with the "protozoa" and claims these as the true exciters of rabies. It is true that for some time before Negri had announced his theory, a number of observers thought that the origin of rabies must be due to the protozoa, particularly Dijestal, who had described having seen in the spine and ganglionic nerves, small bodies like protozoa.

Watson's observations lead him to believe that the Negri bodies are definite protozoan parasites and places them in the suborder of Cryptocysts or Microsporoidia of the Sporozoa.

These bodies are to-day generally known as Negri's corpuscles or bodies, (see plate), and have since been observed and described by a number of other observers, and it must be admitted that they are found with great regularity in rabid dogs and their presence is regarded as diagnostic.

Four hundred and fifty dogs suspected of rabies were examined by Italian scientists; 297 were proved by inoculation to be rabid and in all but nine the corpuscles of Negri were found.

The claim of Negri that this specific parasite (protozoon) is the true and only cause of rabies is a question that is opposed by those observers who have filtered the emulsified brain substance of an affected animal and the filtrate reproduced the disease by inoculation; it is possible, however, that certain of these corpuscles may be so infinitesimal as to pass through the filter and beyond the power of the microscope to render visible.

Pasteur has demonstrated that brain and nerve ganglion lose their infectious virulence only when these tissues have become partially decomposed, that is to say, after four or five days, or even several weeks, while they remain virulent in air-tight tubes or in moistened carbolic gauze. Neustube found that the brain of a rabid dog retained its virulent properties when kept under a slightly elevated temperature for ten or twelve days. Mergel found the virulence as strong as ever in the putrid brain of a rabid wolf fourteen days after the animal had been killed. Galtier noticed the same conditions in the decayed brain substance of a rabid dog, when kept under a low temperature (12° Celsius). An affected brain was not rendered harmless even when exposed for three weeks at a time, but its virulence was attenuated when kept some time at a temperature of 61° Celsius. Blumberg found that an affected brain is rendered harmless when it has undergone a freezing process at 20° or 30°. Galtier was able to destroy the virulence of affected cerebral matter in four to twenty days by placing it upon plates and allowing it to become dry. Saliva and blood are much less resistant than brain matter. Both substances as a rule, lose their harmful properties twenty-four hours after leaving the animal. Dried saliva is inactive fourteen hours after it comes from the mouth of the animal, the gastric juice destroys it in five hours; bile kills it in a few minutes, and it is destroyed quickly by corrosive sublimate, chlorine water, permangate of potash, sulphuric acid, creolin, etc. The X-rays seem to retard the development of the virus.

As a rule Negri bodies are very resistant to the action of mineral acids but are easily destroyed by weak alkaline solutions. Drying, decomposition, warmth and glycerine have little effect upon them.

As a rule, it is necessary to make a natural or artificial inoculation in order to obtain any successful transmission of the rabid poison, as no infection will take place if an animal is given the saliva, flesh, brain or spinal cord of an affected animal, or if the inoculation is simply rubbed on the cutaneous or mucous membranes; but if the mucous membrane is scarified first it can be reproduced. The most certain method to reproduce the disease is to introduce the virus directly on the dura mater of the brain or spinal cord, or in the anterior chamber of the eye. Heredity—that is, transmission of rabies by the mother to puppies or the production of the disease by infected saliva being in food—is very questionable. The most common method, of course, is the bite of the rabid animals; more rarely licking of a wound. In many cases the bite may not be severe enough to cause its development in dogs or in man. Deep bites, however, are certainly the most dangerous, especially when made on the unprotected parts of the body (hands and face in man). Wounds which bleed much are less dangerous, as the poison may be washed out of the wound by the flowing blood. Bites of dogs which have bitten numerous others are less dangerous than the first or second bite made by a rabid animal.

Infectious wounds which were made by biting or inoculation, according to Hertwig's observations, showed only 37 per cent. of positive results, and Renault's 67 per cent. Of 137 animals which were bitten by rabid dogs under observations for the last five years at the Veterinary College of Berlin, six only ultimately developed the disease. Zundel finds that about 25 per cent. of inoculated animals become affected, while Haubner found 40 per cent. At Alfort they have found the proportion to be about 33 per cent., and at Lyons, 26 per cent. In man 50 per cent. of the bitten subjects develop the disease, but if we sum together the cases of true rabid and "suspected" dogs, the proportion is about 8 per cent.

The most dangerous bites seem to be those directly into a nerve or upon nerve tissue, even if it is on the smaller branches of nerves, whereas a bite on blood vessels or the lymphatic system is less so, and artificial inoculation proves that if it is made as near to the central nervous system as possible the disease makes its appearance more quickly, and the injection directly on the dura mater produces the disease in shorter time and more certainly than any other part of the body. Recent investigations have in fact shown that the virus of rabies travels along the nerve courses to the central nervous system, the seat of the disease when fully developed. Pasteur claimed that if the largest proportion of virus is in the brain, it produces furious rabies, and if the virus predominates in the spine it causes dumb rabies. It is possible that the results of the material changes on the animal economy produced by the disease "toxines" may have some effect on the character and severity of the disease, the nature of which is at present really not known.

Anrep prepared a very toxic alkaloid-like substance from the brains of rabbits (furious rabies) which, when injected subcutaneously in minutest quantities produced lowering of temperature, paralysis of the extremities, salivation, and death from asphyxia.

Acton and Harvey found a number of dogs that presented some of the symptoms of rabies. On examination of the hippocampus major no Negri bodies were found, but a blood culture gave a marked pyocyaneus culture in forty-eight hours. They are of the opinion that in certain dogs which suddenly develop viciousness and make unprovoked attacks on persons the Bacillus pyocyaneus may be present.

Pathological Anatomy.—The post-mortem results are generally negative and vary in different animals, but specific alterations are noticed.

Great emaciation with very distinct muscular rigidity and a rapid tendency to decay; collections of mucus upon all the natural orifices, such as the mouth, nose, and the prepuce; prominence of the cutaneous veins, which are found to be filled with thick, imperfectly clotted blood; redness and swelling of the mouth and mucous membranes. The throat is covered with a whitish-gray mucous exudation; intense inflammation of the glands of the pharynx; in some cases slight swelling and hyperæmia of the salivary glands. In the cavity of the throat and mouth we find foreign bodies, such as hair, straw, coal, wood, etc.; they may also be found in the œsophagus, which is frequently very red and covered with clammy, gray mucus. This condition is seen in the stomach which contains little or no food but, as a rule, numerous indigestible objects of various kinds and sizes—straw, hair, wood, stones or pieces of leather or rags. The mucous membrane is reddened and swollen, especially on the surface of its folds, and marked with hemorrhagic erosions, which Johne describes as sepia-colored. The intestine may be empty or it may contain some of the foreign bodies. The mucous membrane of the pharynx is always very red, swollen, and covered with mucus in its anterior portions. These alterations are also seen in the trachea and the large bronchia. The lungs are, as a rule, filled with blood, but otherwise normal. In rare instances we find circumscribed centres of irritation due to foreign bodies being inhaled through the bronchial tubes. The heart and its envelope are generally normal. The inner surface of the pericardium may show hemorrhagic spots. The chambers of the heart, as well as the large blood vessels, are filled with dark, imperfectly clotted blood. The liver and kidneys are hyperæmic. The spleen is always filled with blood, enlarged, and occasionally streaked with hemorrhagic spots; the bladder is found to contain little urine, and this on test is found to contain sugar and not infrequently, bile pigments. Cadiot was inclined to consider glycosuria as a regular symptom of rabies and of pathological importance, but Rabreaux and Nicholas took the ground that while sugar is apt to be in the urine of rabid animals, still its absence did not mean the animal did not have rabies.

The condition of the brain and spine was formerly supposed to present some reliable indications of the disease, but according to the investigations of the last few years it cannot be said that they present any constant pathological alterations. They vary greatly and in some cases may present no noticeable change at all. We frequently find hyperæmia of the covering of the brain and spinal cord, accompanied by slight hemorrhages, and the brain and spinal matter itself contains more blood than usual and is in a more or less œdematous condition.

Kolesnikoff found on microscopic examination of the walls and neighboring vessels of the brain (of dogs which have died with rabies) an accumulation of lymphoid cells and extravasated red blood corpuscles. The accumulation of discolored cells and red corpuscles in the small blood vessels of the walls and perivascular chambers indicates to a certain extent a condition which in rabies is of pathological importance. They are undoubtedly symptoms of inflammation. These changes vary in different cases. According to Czoker, it was noticed to a very slight degree in dogs affected with the furious form of rabies, but it was noticed to a marked degree as soon as the disease developed the dumb form (the perivascular spaces and their neighborhood were filled with leukocytes).

Babes found nodulated infiltration in the spinal cord of dogs that he called nodules rabiques (rabid nodules). Other observers have, however, found them in distemper. Van Gehuchten and Nelis found in the cerebrospinal and sympathetic ganglion of a street dog that died of rabies definite lesions, such as infiltration, tumefaction and ecchymosis, and great proliferation of the endothelial cells of the capsule that covers the ganglionary cells, and emigration of the mononuclear cells and a destruction of the ganglionary cells (neurophagy). The plexus nodus vagi is frequently attacked. These alterations in the nerve tissues are not always present in the disease and cannot be used as positive evidence of the disease. Valleca and Manonelian found similar infiltrations of the ganglia in very old dogs, and other observers found these modifications in less degree in other diseases. Similar alterations have been noticed in other diseased conditions, such as chorea, tetanus, distemper and meningitis.

Clinical Symptoms and Course.—The period of incubation lasts in the majority of cases from three to six weeks. In very rare instances the disease may appear in one week. According to Haubner's observations upon nearly 200 dogs, in 83 per cent. of the cases the disease developed in two months; in 16 per cent. of the cases within three months; and in 1 per cent. four months, or even later. Zundel has calculated that in 264 dogs 1 per cent. became affected within twenty-four hours after being bitten; 11 per cent. between the second and third day; 33 per cent. between the fifteenth and thirtieth day; 19 per cent. between the thirtieth and forty-fifth day; 10 per cent. between the forty-fifth and sixtieth day; 16 per cent. between the sixtieth and ninetieth day, and 10 per cent. after three months. The longest period of incubation was observed by Leblanc; this case developed in 364 days. The period of incubation is shorter in young than in older dogs. In the human race it is generally admitted that the average period of incubation is seventy-two days (this average covers over 510 cases).

There are two forms of rabies—a furious and mute (or dumb) form. The first is more frequent, but there are numerous transitions between the two forms; dogs that are at liberty or vagrant dogs are more apt to have the violent or furious form, while dogs kept as house pets or who are restrained are more frequently affected with the mute or dumb form, and in dogs that are well trained and under control and have lived in close contact with man, the tendency to bite is only present when they have reached the point of true delirium and mental control is gone. Pasteur found that intracranial injection produced furious rabies, while subcutaneous injection almost invariably resulted in the dumb form.

Furious Rabies.—This comprises three distinct stages, between which there is frequently a very indistinct line of demarcation—namely, the prodrome or melancholic, the stage of irritation, and the paralytic stage.

In the melancholic stage the dogs seem to change in their disposition. They are capricious, and at other times irritable or depressed. They show symptoms of anger, are easily excited, fretful, change from one place to another, are easily frightened on the slighest cause or may become very affectionate. They soon show a tendency to gnaw or swallow indigestible substances. They refuse their usual food, or they may take such food as they have a special taste for, holding it in their mouth for a few moments and then let it drop out of the mouth again. They will lick and gnaw, in a greedy manner, various objects, such as wood, coal, furniture, and eat straw, earth, stones, wood, blankets, and even their own faeces. In one case observed by Govard, the animal would howl loudly, have an evacuation of faeces and immediately eat it. There is commencing evidence of paralysis in difficulty in deglutition, cough, and labored respiration. The sexual desire is very much increased, and we see in the first stage an uncertainty in the gait and a weakness in the hind-quarters. Constipation is invariably present. After a short space of time, generally from one to three days, the second stage appears. This is the irritable or maniacal stage. This is characterized: 1. By a tendency to escape and run away; 2. by a great irritation and an inclination to bite animals, objects, or man; 3. by a strange alteration in the voice, or bark.

The inclination to run off is very marked. They will eat through wooden boxes or floors, tear chains apart, or dig great distances through earth. As soon as they get their liberty they will run about aimlessly, covering very much ground in a short space of time, and return in one or two days, showing every indication of great excitement or of having travelled long distances. When they return they are covered with dirt and utterly exhausted, and may be very quiet and well behaved for a short time. During this condition they bite any object that comes in their way. Soon the delirium increases and they run around in an insane way, attacking and biting anything that is within their reach, snarling or biting all the time, and if they are confined they bite at the bars and frequently break their teeth, and if a stick is held toward them they attack it furiously. As a rule these cases do not tear or mutilate their own bodies, and, if they do, they generally bite the region of the wound where they were formerly bitten or the toes of the posterior extremites. In the first stage of the disease we have often noticed that they will lick and bite places where they have had wounds before. The patients snap frequently, as if they were catching flies, and, as a rule, will bite any animal that will come within their reach.

The biting and delirium are not constant, but appear after alternate periods of rest, followed by uncontrollable delirious attacks, especially if another dog should come near. These attacks may occur at intervals varying from one to four hours. The peculiar change in the voice is due to a paralysis of the vocal cords, and the sound of the bark is prolonged into a higher vocal sound, so that it makes a combination between a howl and a bark, which has been described by different authors as a "howling" bark. This is harsh and shrill. Repugnance to water does not exist in the dog as in man, but toward the end of the second stage, from paralysis of the muscles of deglutition, we see great difficulty in swallowing, and very often see an animal pick up some indigestible object, attempt to swallow it, and, not succeeding, drop it from its mouth. Frequently the animal will lap out of his bowl, but it is seen if observed closely that he does not swallow any of it, on the other hand animals may cower and draw away from water that has been spilled on the floor of the cage. Vomiting sometimes occurs. There is great difficulty in defecation, which seems to produce evident pain. There is very little alteration in respiration, but it may be slightly increased. The pulse is increased; the temperature also rises, but falls toward the end of the course of the disease.

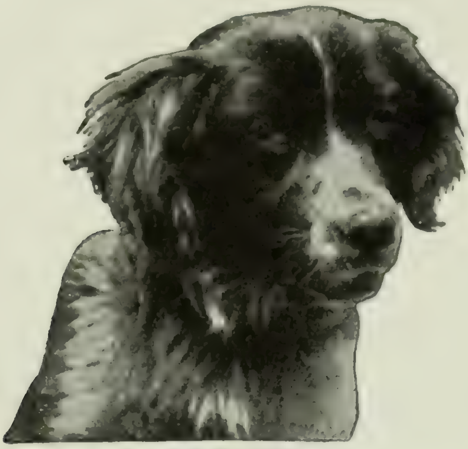


Fig. 138.—Peculiar, anxious or lurking facial expression in rabies. (*Marek.*)

The duration of the second stage, which does not always present all of the characteristic symptoms of this condition, may last from three to four days. After the paroxysms have increased in intensity and the intervals between them grow shorter, the paralytic, or last, stage begins. The animals rapidly become emaciated; the eyes are staring, dull, and the eyeball is retracted into the skull. The conjunctiva is generally hyperæmic, the cheeks are sunken; the hair is erect; and we begin to see symptoms of paralysis. As a rule, the first sign of this is a paralysis of the muscles that close or raise the lower jaw. This allows the saliva to run out of the corners of the mouth and form threads which hang down, and we easily recognize the fact that the tongue and lower jaw have lost their power. The tongue becomes lead-colored and hangs out of the mouth. Soon we see paralysis of the posterior extremities. This begins with a staggering, unsteady gait, and finally total inability to use the posterior half of the body. Then the animals stretch themselves out and become completely paralyzed, or in the last stage we may see convulsions, but that is very rare. Death, as a rule, occurs in the fifth to the seventh day after the onset of the disease. In rare instances it may last ten days. Variations may occasionally occur in the regular course of the disease; for instance, paralysis of the posterior extremities has been the first symptom observed, and in others the paralysis of the jaw has not been observed, and dyspnœa has been observed for hours before death.

Dumb Rabies.—The mute or dumb form of rabies, according to Bollinger, comprises about 15 to 20 per cent. of all cases. The average given of this form of rabies is entirely too small, and should be at least 50 per cent., the great majority of cases observed being the dumb form. This is distinguished from furious rabies by the fact that the irritating or nervous symptoms are less marked, and in very rare cases entirely absent, also that the paralytic symptoms appear early in the disease. First, we see paralysis of the muscles of the lower jaw. The mucus or saliva runs out of the opened mouth, and an inclination to bite is entirely absent, although under certain conditions when the mouth is forcibly opened the animal will be able to bite. The voice is also changed, but it is very rarely heard. We see a loss of appetite, the animal being unable to seize or swallow foreign bodies. In this quiet form the three stages follow very closely on each other, the course of the disease being very rapid, and death, as a rule, appears in two or three days, never over five.

These two forms of rabies in rare instances may merge one into the other so that it is intensely difficult at times to separate the different forms, for instance a case which we will cite illustrates this. The affected animal twenty-four hours before his death had a hoarse bark, no appetite, and the muscles of the mouth appeared normal, he allowed the mouth to be examined and the tongue pressed down to see the throat, there was not the slightest inclination to bite or show any signs of delirium or mental aberration; when the animal died he showed great sexual excitement. On post-mortem the stomach was found to contain hay, straw, as well as hair that did not come from his own coat.

This disease must always be considered fatal. Recoveries are rare exceptions (usually inoculation rabies).

The diagnosis of rabies may be complicated by certain conditions present, due to other diseases. This is especially noticed in the mild form and in well-trained affectionate animals which obey their masters to the last. Two instances in which the English setter was under complete control; hunted in the field, obeying the whistle and call instantly, and at the same time had every symptom of dumb rabies. Often we see cases where the history is either insufficient or the owner can give none at all. On the other hand, in the furious form, a history, as a rule, is not required, as the disease can be instantly recognized from the appearance of the animal. Great excitement and restlessness, a tendency to escape, biting and delirious actions, rapid emaciation, and debility are characteristics of the furious form of this disease, while great depression and paralysis of the lower jaw are characteristic of the dumb form. In both forms there is a great inclination to gnaw objects. Sexual desire, in the early stage, is prominent. A depraved appetite and altered bark, more or less rapid symptoms of paralysis, and the cases being invariably fatal. The post-mortem confirms the disease when we find acute hyperæmia of the throat, pharynx, and hemorrhagic erosions on the mucous membrane, also foreign bodies, etc., in the stomach.

Regarding the presence of sugar in the urine of rabid dogs, that cannot be said to be of special significance, as it is found to be present in other diseases. The presence of the corpuscles of Negri in a suspected animal, on the other hand, must be regarded as a diagnostic symptom of great importance, particularly as it is a means of making a quick diagnosis. The horn of Ammon is where these corpuscles are found in the largest quantities, and it requires one to be thoroughly familiar with these bodies to recognize them quickly and easily. They are found in particles of the horn of Ammon fixed in Zenker's fluid, and treated with a 10 per cent. solution of osmic acid, then washed thoroughly and then laid in absolute alcohol; this method has the disadvantage of taking some time to accomplish it. The method of Bohne seems to be the most desirable. Mode of procedure: sections one-half to three-fourths mm. thick are cut from the horn of Ammon and put in 15 c.c. of acetone and left at a temperature of 37° until they become hardened, then the sections are transferred to liquefied paraffine and left there for an hour at a temperature of 60°, then the sections are put in cold water to which a small quantity of gum arabic is added and put in a stone and the paraffine carried off, then the sections are colored by means of Mann's process, which is to put the sections for one-half to four minutes in a coloring solution consisting of 35 c.c. of 1 per cent. aqueous solution of methylene blue and 35 c.c. of 1 per cent. aqueous solution of eosin and 100 c.c. of distilled water. The sections are rinsed with water and then put in absolute alcohol for 15 to 20 seconds, to which has been added some caustic soda (to 30 c.c. of alcohol add 5 drops of 1 per cent. solution of absolute alcohol). The sections are again put in absolute alcohol for a few moments and then washed in water for a minute; the sections are now put in water slightly acidulated with acetic acid, drained and sealed with canada balsam.

The following procedure has been the method employed for the rapid diagnosis of rabies in the laboratory of the Veterinary school of the University of Pennsylvania for several years: As soon as the animal's head arrives at the laboratory the entire brain and the plexiform ganglia, with the adjacent sympathetic ganglia are removed. A portion of the cerebellum is placed in sterile glycerine, in which the brain tissue may be preserved and retain the virus for many weeks. These glycerine-immersed specimens are only referred to for the animal inoculation test when the microscopic examination is unsatisfactory. Aside from preventing decomposition, the glycerine will also destroy bacteria and check decomposition of the specimens. From the fresh brain tissue, smears are usually made from the hippocampus major and cerebellum. A piece 1 mm. thick and several millimetres in diameter cut from the freshly exposed surface, after an incision is made through the hippocampus major at right angles to its length, or of the cerebellum in which an incision has been at right angles to the convolutions, is placed upon a slide near one end. Instead of using a cover-slip, another slide is placed over the small piece of tissue and gentle pressure is applied and the opposite ends of the slides are moved toward one another. The smears are then placed in absolute alcohol for two to five minutes, whereupon the alcohol is allowed to evaporate and the smears then stained. The stain as recommended by Van Giesen is used.

Loeffler's alkaline methylene blue,	1 part.
Distilled water,	1 part.
Saturated alcoholic solution of fuchsin added in drops until the mixture has a purple tinge, or until a metallic scum is seen on the surface.	

The mixture kept at a low temperature can be used for an unlimited length of time, but it is apt to change quickly at room temperature, and for this reason a new batch of stain is usually made each day or as each specimen is prepared for examination. A smear properly fixed on a slide is taken up with a pair of forceps and completely covered with stain. The slide is passed through the flame of a Bunsen burner several times until steam arises from the heated stain, which is permitted to remain on the smear for five to thirty seconds. The smear is then washed in running water, and if the color of the smear is blue where the brain tissue is thickest, and red where the smear is thin, the slide is placed between filter-paper and dried. As soon as the slide is dry a search is made for large nerve cells with a low-power lens under the microscope. The protoplasm of the nerve cells should be stained a light blue, the nucleus a shade of purple, and the nucleolus a dark blue. If the cells are stained too deeply the stain may be weakened by the addition of more distilled water or in heating the staining fluid on a smear for a longer time, the intensity of the staining of the fuchsin will be increased at the expense of the blue of the Loeffler's alkaline methylene blue. When a nerve cell is found properly stained, it is examined with an oil immersion lens. Negri bodies with this staining fluid show the inner bodies a bluish black and the structure around the inner bodies a maroon-red. They are found within the cell, outside of the nucleus of the cytoplasm in the nerve cells of sections, but not infrequently in the smear preparations, a few Negri bodies not within the nerve cells are seen, which have been forced out of the nerve cell as the smear is made. In searching a smear for Negri bodies, only those bodies within the nerve cells should be considered.

In doubtful cases the disease can only be accurately diagnosed by vaccination—that is to say, by the injection of small quantities of horn of Ammon or a section of the cord, which have been diluted with distilled water, and emulsified and filtered through fine linen. The following methods are used at present:

(1) **The Intercranial Subdural Inoculation (Pasteur).**—The inoculating material (1 or 2 drops of the emulsion) should be injected into the dura mater of a dog or rabbit, after it has been trephined, by means of a small hypodermic syringe, and the wound sewn up. The operation is easily performed, and is especially valuable when the suspected anima' may have bitten not only other dogs, but man. As this inoculation from the spinal matter of a suspected dog takes at least two or three weeks, sometimes longer, the animal develops all the phenomena of the disease, paralysis, etc., on the quiet. Leclainche recommends intracerebral inoculation, that is, direct injection of the inoculating substance into the brain itself; the persons bitten should not delay, while waiting for development, but all measures should be taken as soon as possible.

(2) **The Intraocular Inoculation (Gibier, Nocard, Johne).**—The emulsion (1 to 2 drops) which is thus obtained is filtered through a piece of linen and injected directly into the anterior chamber of the eye of the animal which is to be inoculated. They do this by means of a small hypodermic syringe, having first placed cocaine on the cornea, and then inject the solution directly into the anterior chamber. If the suspected animal is rabid, we will see the development of the disease in from twelve to twenty-three days, even if the chamber should suppurate from the irritation of the injected solution. Gal and Klimmer oppose this procedure by pointing out the fact that the stage of incubation may be much longer than this.

(3) **The Intraspinal Method** (**Labell**).—The emulsion is injected directly in the cord; this method takes somewhat longer to develop than the subdural inoculation.

(4) **Intramuscular Inoculation.**—One c.c. of the emulsion is injected into the masseter, the dorsal or the posterior crural. Klimmer finds that the active symptoms are developed somewhat earlier than by the intraocular method.

There are other methods of inoculation used but they are much less reliable, such as nasal, subconjunctival, subcutaneous and intravenous.

It is always well to inoculate two animals, because it frequently happens that an animal is immune to the disease or dies shortly after the inoculation (cerebral hemorrhage, etc.).

The following diseases are sometimes mistaken for rabies: Certain affections of the brain, such as teething, epilepsy, eclampsia, distemper, angina, intestinal parasites, inflammation of the intestines, pentastoma in the nose and frontal cavities, foreign bodies in the mouth (between the teeth) or in the throat, paralysis of the lower jaw, luxation of the lower jaw, due to irritation of the trigeminus, intense excitement in bitches that have had their young taken from them, great sexual excitement in male dogs, long confinement in cages or kennels, and from certain poisons. The course of the disease, however, and the after-symptoms always enable one to make a differential diagnosis.

Therapy and Prophylaxis.—As soon as the disease has reached a point where there is no question as to its character, the animal should be destroyed as soon as possible. When man is bitten it is a question whether thorough disinfection or cauterization of the wound is of much benefit unless it is done within a few minutes. In reference to the preventive inoculation of Pasteur, it is not necessary to enter into detail in this work, beyond the fact that it is the inoculation of an attenuated virus cultivated from rabies. A large number of experimenters have made repeated inoculations with a view of obtaining immunity to the disease, but they have not had very satisfactory results. Recently there has been advocated as a prophylactic measure a one injection method of anti-rabic vaccine. This method had been accepted by certain cities and communities and no dog can get a license or be registered unless the owner of the animal can produce evidence that the dog has been injected with the said vaccine.

The evidence that this is a reliable method and based on facts is wanting unless we quote some statistics that were made in Japan in some towns and villages, and there is a question at the present time whether it does bring immunity and how long will the immunity last.

Until there is more can be said of its benefits and facts can be stated that are based on time and experience, it will not be wise to advocate its use.

This is a terrible disease in the canine family and experimenting with such a disease broadcast there is always a loophole for error in the preparation of the biological material, and its use.

The most effective method of preventing the spread of rabies is to register all dogs claimed by owners, and all stray dogs should be destroyed, and when there is a case of rabies or a suspicion of such, all dogs should be put under observation, muzzled or put on a leash, and any dog known or suspected of having been bitten by a rabid dog should be confined and watched by a competent veterinarian and if found to develop the active symptoms it should be immediately destroyed and the head sent to the local live stock sanitary board laboratory for examination.

In the large cities all dogs, if they are worth keeping as pets, should be taxed and all vagrant mongrels taken up and destroyed. In America and England where they have made a close study of the spread of rabies and have reached the conclusion that while muzzling is a protective measure, it is by far the least point of danger, for an owner that will take the trouble to muzzle his dog is one who closely observes his animal and at the first sign of the disease has him examined. Invariably the outbreaks of disease originate either in the slums of cities or little villages, where the low class of ignorant shiftless masses live, who protect and have around their places a number of mongrel curs that are valueless; the owners or protectors of these pariahs will neither observe their animals nor restrain them when they develop rabies, but drive them off, or allow them to go on their travels to bite and tear every animal that comes in contact with them. Taxation has been tested out in Europe and in every case where mongrels were gathered up and destroyed rabies decreased one-half or more—in some cases not a single case was recorded.

Tuberculosis.

Under this name we class all affections which owe their origin to a peculiar specific bacterium known as "tubercle bacillus," discovered by Koch. These are found in all tubercular deposits in man or in animals, whether they occur spontaneously or are inoculated. Under the microscope they appear in the shape of very narrow non-flagellated rods often slightly curved, from 1.5 to 4μ long and 0.2-0.5μ diameter. The organism shows many variations in its morphology under different conditions.

It often occurs in isolated clumps, either in cultures or in tissues. In certain cultures and in animal tissues it grows in the form of longer or shorter branching threads or even in the form of granules.

The tubercle bacilli should be considered as true parasites which multiply and live in the body only, but they also seem to possess the property of living outside of the body for a certain length of time, as the excretions of tuberculous animals can be used successfully to inoculate other animals. We therefore conclude that tuberculosis is only produced by infection, or a better term would be transmission of tubercle bacilli, direct or indirect, from one subject to another.

While it is well known that tuberculosis of man and of certain domestic animals, such as cattle, is very common, it is rather rare in dogs. A number of schools have found that only from 2 to 5 per cent. of all of the animals brought to the clinics were affected with tuberculosis. Dogs seem to possess more power of resistance and are able to throw off the disease.

While, as is well known, tuberculosis is a common disease of man and of certain domestic animals, particularly the ox, it is comparatively rare in the dog. In Saxony, where from 3,500 to 4,000 dogs are annually slaughtered for food and subjected to the usual post mortem inspections, 0.62% were found tuberculous in the period from 1898 to 1907, and 0.53% in the period from 1908 to 1917. During some of these years no cases whatever were found. It must be remembered, of course, that only such dogs as are apparently sound internally, are ever slaughtered for food.

Of 2,156 dogs that were dissected in the pathological institute of the Veterinary College of Dresden, according to Joest, 18 or 0.83% were tuberculous. According to Eber, of 400 poisoned dogs, 11 or 2.75% were tuberculous. According to Redderoth, among 1,100 poisoned dogs in Leipzig, 13 or 1.2% were tuberculous. The percentage is about the same in Holland where, in Utrecht, 16 out of 764, or 2.1% of the dogs were found tuberculous. In Amsterdam (Markus and Schornagel) 14 out of 745 or 1.87% of all dogs dissected were tuberculous. Denmark and France furnish less favorable statistics. But everything considered, the dog, under ordinary conditions, shows only slight susceptibility to infection with tuberculosis. Experiments at various institutions have shows that infection is usually possible (or successful) only by means of direct inoculation, or inhalation of tuberculous material. Direct inoculation produced positive results in hardly one third of the cases, inhalation in practically 100%, while ingestion of tuberculous material almost invariably gave negative results. Considering the rarity of this disease in the dog, we will not give any detailed explanation of any length concerning its etiology, pathological anatomy, etc.

Etiology and Pathological Anatomy.—A number of observers agree to the fact that, as a rule, an animal affected with tuberculosis has been at some time near or in the vicinity of some person who was in an advanced stage of consumption. In such cases the bacilli may be introduced in the form of fine dust and be respired into the lungs or may be taken up by the intestines, finding their way into the bowels mixed with food. It seems that tuberculosis of the dog is usually due to the human type of the bacillus. Petit observed that this form usually occurs in dogs from dirty, ill kept kennels. In one case which the writer observed there were tuberculous ulcers in the parotid region, and also tubercular deposits in the lymphatic glands of the neck. The disease appears in the dog in the form of an acute or local tuberculosis. The disease may be found in the lungs, the mesenteric glands, the intestines, liver, kidneys, and peritoneum, and in rare instances affecting the entire body.

In regard to the organs most frequently affected with tuberculous lesions: In 40 cases examined by Cadiot the lungs contained lesions in 33, pleura 25, bronchial and mediastinal glands 25, pericardium 8, heart 3, liver 24, kidneys 17, spleen 5, intestinal mucous membrane 5, mesenteric glands 10, peritoneum and omentum in 5 instances. Exudative pleuritis and ascites were present in 19 and exudative pericarditis in 5 instances. In 28 cases examined by Jensen the lungs and regional lymphglands were affected in 19, the thoracic and abdominal serous membranes in 14, the kidneys in 12 and while the intestinal walls were less frequently affected the opposite conditions were observed in regard to the mesenteric lymph glands; the spleen showed lesions in two instances while the heart was attacked but once. Among 11 cases observed by Eber, the lungs were the chief seat of the disease in 9; in only two cases were the lungs found intact and lesions confined to other organs. In two cases (dogs under two years of age) the anterior mesenteric gland alone were affected. There was only one case of generalized tuberculosis in which, also, miliary tuberculosis of the kidneys was present. In Froehner's reports the percentages were as follows: Lungs, including pleura 90%, liver 80, bronchial and medistinal glands 50, pericardium 40, kidneys 25, spleen and generalized tuberculosis each 10%. Among ten cases reported by Ratz the liver was affected 7 times, the lungs and kidneys each 5 times, pleura, pectoral lymph glands and spleen each 4 times, mesenteric lymph glands 3, skin, pericardium, intestines and peritoneum each in two instances, and the cervical glands, pancreas, ependyma, larynx, aorta and sternum each once. Petit and Basset found that in 32 cases examined by them, the pleura was affected in 19, pericardium in 15, peritoneum in 10, lungs in 25, intestines in 3, liver in 14, kidneys in 9, endocardium in 2, myocardium and spleen each in one instance. In 13 cases examined by Redderoth 7 showed affection of the mesenteric lymph glands only, without involvement of any other organs. Eight dogs artificially infected with human tubercle bacilli by Schrum, showed infection of the pleura in 7 instances, infection of the subpleura only, in one instance; in two instances the pathological changes were confined to the parenchyma of the lungs. The peribronchial and the mesenteric lymph glands were each affected in one instance and one dog developed a local abscess at the point of inoculation.

Pulmonary Tuberculosis.—This presents numerous anatomical alterations: over the entire lung we may find firm round gray nodules (miliary tuberculosis), or they may break down, forming caseous nodes and cavernous hollows or there may be a chronic indurated broncho-pneumonia, with centralized softening or breaking down of the newly formed tissue; more rarely we find chronic interstitial indurating pneumonia with secondary alterations, acute and chronic bronchitis, peribronchitis, bronchiectasis, pulmonary hyperæmia, emphysema, and frequently adherence of the lung to the pleural wall.

In nearly 50 per cent. of all cases, the lymphatic glands of the thorax, especially the bronchial glands and the glands which are located above and behind the mediastinum, are invariably infected to a marked degree with tubercular deposits, and are found to be very often enlarged, forming large tumor-like masses. These consist of a lardaceous tissue, grayish-white in color, and generally contain a centre cavity filled with a cheese-like mass. True cheesy tuberculosis is rather rare in the dog, but, on the other hand, we find a peculiar process of absorption of the tissues, forming white masses, which on examination are found to be tuberculous deposits.

Pleural Tuberculosis.—When the process of breaking down, or disintegration, has gone on to any marked degree, the tuberculous mass forms a tumor-like body containing in its centre a whitish fluid held in fibrinous tissue. This was noticed in 50 per cent. of the cases observed in the dog where the lymphatic glands had undergone this degeneration. In the other half of the cases, the serous membranes of the abdominal cavities were covered with tubercular masses, the pleura being the most common seat of the disease. In the majority of cases of pleural tuberculosis it takes the form of what is known as the "pearl" tubercular masses or pearly tuberculosis. These are found to be deposits of soft connective tissue, occurring in the form of numerous conglomerating granulations or in large round tumors. In some cases there is extensive exudative inflammation present (sero-fibrinous and purulent pleuritis). Tubercular inflammation is found in the pericardium, with extensive adhesion to the heart, and a very peculiar alteration of the mediastinum has been observed in several cases. The heart rarely presents any tubercular formations.

Tuberculosis of the peritoneum resembles tuberculosis of the pleura in its anatomical changes. The peritoneal sac, according to Cadiot, usually contains a certain amount of clear or turbid fluid; the parietal peritoneum may be free from lesions or covered here and there with tuberculous proliferations. The mesentery and omentum are more frequently involved and the latter may assume extraordinary dimensions.

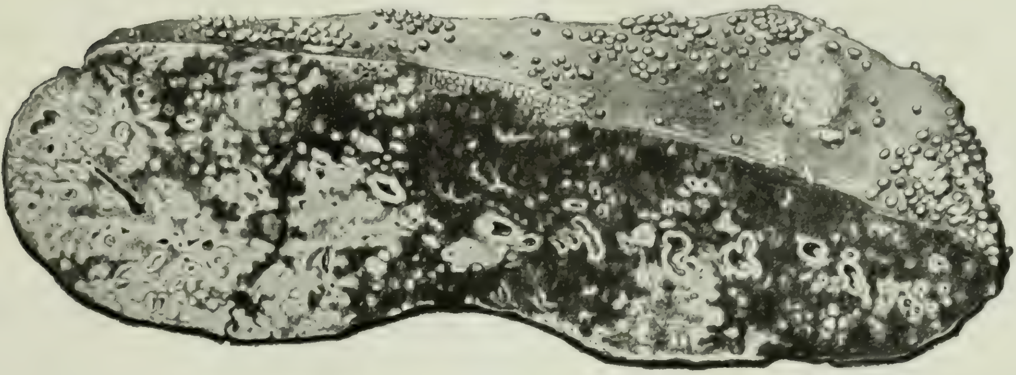


FIG. 139.—Pulmonary and pleural tuberculosis.

In the digestive organs, the lymphatic glands of the head and neck are rarely invaded; and the writer found the submaxillary and retropharyngeal lymphatics to be affected in only one instance. On the other hand, the mesenteric glands were particularly affected, some cases presenting large tumor-like masses containing broken-down centres.

Tuberculosis of the intestines is rare, and is restricted to slight ulcerations or abscesses. The liver, as a rule, is generally involved to a marked degree, its substance being filled with small nodules or large granular masses which are milky white in color. In the centre of these is found a broken-down opaque fluid, the result of fatty degeneration. The spleen was found by the writer to be tubercular in two cases, and that only to a slight degree. In the liver are found numerous firm white fibrous nodules ranging from the size of a pea to the size of an egg. The kidneys are frequently the seat of more or less tubercular deposits, and in twelve cases scattered granulations were found in the spinal and membranous substance, but cheesy abscesses and centres were also found. These were accompanied by chronic indurative nephritis. Ulceration of the pelvis of the kidney was observed in one case. One dog showed but a slightly tubercular ureter and bladder. The sexual organs are, as a rule, found healthy and very rarely attacked by the disease. In rare instances a tubercular testicle is noticed.

Tuberculosis of the prostate has been observed, also in the ovary, the bones, articulations and in the brain. A tuberculous ulceration of the skin has also been seen. For further particulars as to the pathological character of tuberculosis, consult the numerous works on the subject.

Tuberculosis of the kidneys may involve one or both of these organs. The miliary type is the most common. Large cheesy abscesses or foci are more rarely seen.

Similar conditions prevail in regard to affections of the spleen.

In tuberculosis of the liver this organ is either shot with innumerable gray or white, firm, fibrous nodules not exceeding in size that of a pea, or there is a smaller number of larger lesions (some approaching the size of an egg) consisting of soft centered nodules. Both of these forms of lesions may be present at the same time, and the organ increased enormously in volume.

Intestinal tuberculosis is rare and is usually limited to the presence of a few cheesy nodules or insignificant ulcers in the duodenum or ileum. The regional lymph glands are almost always involved.

More uncommon that the foregoing are tuberculous affections of the pancreas, genital organs, bones, articulations, subcutaneous connective tissue and skin, the brain and its membranes. Marchant and Petit describe a case in which the cerebellum had been transformed into a single large tubercular nodule while the medulla oblongata, protuberantis and pedunculi cerebri were riddled with white shotlike nodules. Ball observed isolated tuberculosis of the pharynx. Cadiot described a case of laryngeal and bracheal tuberculosis. The term arthropathia tuberculosa was used by Cadiot and others to designate the diffuse and usually symmetrical enlargements which are observed in the bones of the extremities of dogs. They are said to be caused by the toxines of tubercle bacilli.

Clinical Symptoms and Course.—On account of the various ways in which tuberculosis appears, no postive line of symptoms can be made.

Acute miliary Tuberculosis is very rare and runs its course with intense rapidity, and generally it is only by the presence of the tubercular bacilli in the blood that it can be recognized.

Chronic Tuberculosis.—The animal is easily fatigued, short breath, particularly after any slight exertion, irregular appetite, there is a dry hollow cough, generally on rising after resting or after eating, later the cough becomes more frequent and painful, and there may be a muco-purulent discharge from the nose, difficulty in respiration—this at first is slight, but sooner or later it is very pronounced; on auscultation there is a vascular murmur, and later bronchial râles of diverse forms and intensity; later a pleuritis and a hydrothorax. Valuable animals presenting these symptoms may have the diagnosis made positive by inoculating a rabbit (intraperitoneally) with the pleural exudate, and if the exudate was tubercular, three weeks afterward the spleen and the peritoneum of the rabbit will show the tubercular lesions, or we find a tubucular mass on the liver.

Tuberculosis of the lungs only will show marked symptoms after it has made considerable progress, and as the symptoms are very similar to chronic catarrh of the lungs or chronic lobular pneumonia, it is apt to be confounded with these two diseases (see this disease). Notwithstanding a good appetite, when there is rapid emaciation and a quick loss of strength we should suspect the animal has tuberculosis of the lungs but we can only be positive of our diagnosis by recognizing the tubercle bacilli in the secretions, although it is very difficult to find the bacilli as it is not only extremely difficult to obtain sputa from a dog, but to find the bacilli if we do get some of the sputa (see later, tuberculin test).

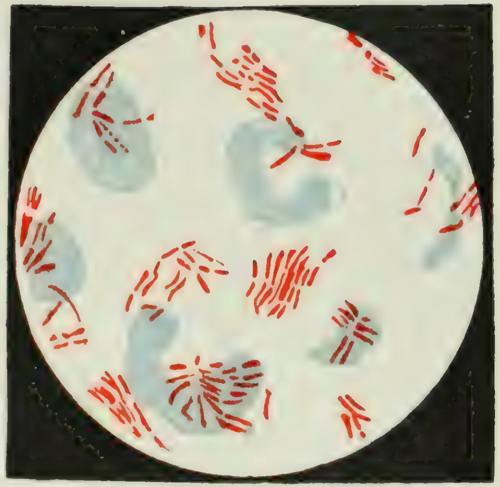
Tuberculosis of any of the abdominal organs is very difficult to recognize. The only way we might succeed is by manipulation of the abdominal cavity, recognizing swollen lymphatic glands or tubercular masses on the liver. We do find, however, great emaciation and symptoms of chronic catarrh of the intestinal tract. These last two symptoms are generally sufficient to make us suspect intestinal tuberculosis. In one case of tubercular ulceration of the intestines which was observed by the writer, the dog was very thin and had shown this emaciation for some time. There were also present symptoms of catarrh of the lungs, and upon the upper portion of the neck a deep abscess had formed. This was quite large and contained quantities of thin pus. In the region of the neck near the abscess we observed a granular mass the size of a chestnut. This could be pushed under the cutaneous membrane and moved about freely. There were also present a few enlarged lymphatic glands in the upper portion of the neck.

A very important and constant symptom of tuberculosis is the gradual emaciation of the affected animal, accompanied by exhaustion on the slightest exertion, the hair is hard, dry and bristly, the eyes are sunken, the face drawn and wrinkled, the visible mucous membranes pale or yellowish, the mucous membranes are dry, the pulse small, accelerated, and the heart throbs, the temperature is elevated from time to time, the appetite is irregular but generally small, constipation alternates with obstinate diarrhœa, and finally the animal becomes a skeleton and dies in a state of collapse; at this stage the temperature is apt to be subnormal. The average duration of the disease is from six to eight months.

Microscopical Demonstration of the Tubercle Bacilli.—The tubercular matter is placed on a glass and allowed to dry in the air; it is then covered with Ziehl's carbol fuchsin solution (1.0 fuchsin, 10.0 absolute alcohol, 5.0 carbolic acid, 95.0 distilled water) and heated over the flame for two minutes. Then it is allowed to cool, then washed with distilled water and then put in Gabbet's solution (2.0 methylene blue, 100.0 of 25 per cent. solution of sulphuric acid); after lying in this for two minutes it is rinsed with water and is ready for examination. The tubercle bacilli are stained red, the other substances being blue; an oil immersion lens gives the best results. Where the examination must be made as soon as possible, if the preparation is thoroughly dried, it gives almost as good results (see Plates).

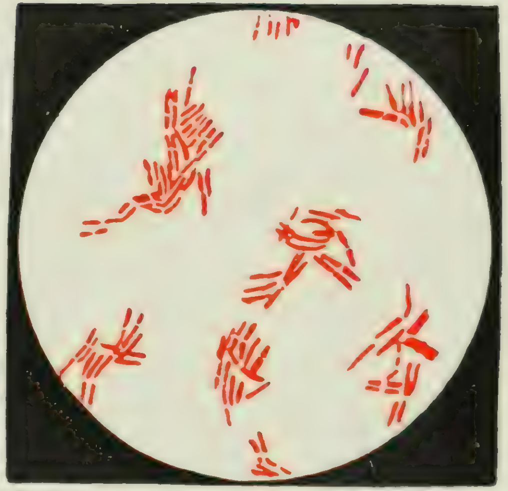
Tuberculin Test.—The inoculation of Koch's tuberculin to determine whether a dog is affected with the disease may be tried, but as a rule is unsatisfactory, the reaction is seldom very pronounced in character, and in the acute stages of the disease it may even give a subnormal temperature; in several instances an animal gave a reaction, but careful examination failed to give any evidences of tuberculosis. Recently the ophthalmic test has come into popular favor in diagnosing tuberculosis in the dog. The method is quite simple. It consists in dropping into the conjunctival sac 1 or 2 drops of tuberculin, especially prepared for this test. If the animal is suffering from tuberculosis, a reaction will be manifest by the development of a conjunctivitis in from eight to twelve hours. There will be excessive lachrymation, injection of the capillaries of the conjunctiva and even slight suppuration at the inner canthus. In chronic cases the reaction may be overlooked unless the animal is kept under close observation, inasmuch as the acute symptoms come on and pass off very rapidly. In cases of recent infection the reaction may last for at least twenty-four hours.

Therapeutic Treatment.—When you have once established the fact that the animal is affected with the disease, it is the duty of the veterinarian to warn the owner of the tubercular or suspected dog, of the danger of infection, and advise him to destroy the animal. In the early stages of the disease and when there are no other animals kenneled with it, the animal can be fed with highly nutritious food and given inhalations



W. McDougall, del.

A SMEAR OF MUCOUS FROM THE
BRONCHIAL MUCOUS
MEMBRANE OF A DOG.



W. McDougall, del.

CULTIVATION OF TUBERCULAR BACILLI
ENLARGED 1000 DIAMETERS.

of creolin or benzoin. An attempt at treatment might be made in the earliest stages of the disease, viz: Abundant nutritious food, fresh air free from dust contamination, systematic administration of creosot (creosotum carbonicum) or guajacol (Guajacolum carbonicum). Iodine preparations (potassium iodide, iodipin) and Fowlers arsenical solution have been recommended.

Kreosot. Carbon.	10.0
Olei Jecoris Asell.	90.0
M. D. S. Daily—2 to 3 teaspoonfuls.	
Guajacol. Carbon.	10.0
D. S.—Tip of spoonful morning and evening.	

Hemoglobinuria and Piroplasmosis.

When there is any decomposition of red corpuscles in the body (hemoglobinæmia) the coloring substance is eliminated through the kidneys, staining the urine and producing hemoglobinuria. In this condition the urine is characterized by a dark red, dirty brownish or brick-red coloration.

This condition occurs when from some cause the coloring matter of the blood becomes liberated, either from destruction of the blood corpuscles or separation of the coloring matter from the stroma of the corpuscle or a delixiviation of the erythrocytes. If only a small quantity of coloring matter is freed it is taken up by the liver, but if a large quantity is free in the circulation, it is also taken up by the urine.

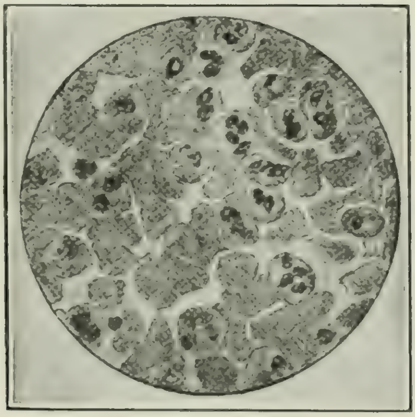


FIG. 140.—Blood of a dog affected with piroplasma canis, magnified 350 times. (*Kastner.*)

The hemoglobin test consists of drying a certain quantity of urine in a small saucer, and with the dry mass we mix a small quantity of finely pulverized chloride of sodium, placing it on a plate. Then add two drops of cold glacial acetic acid. Now slowly heat the cup over an alcohol lamp and allow it to cool. As it does so, you will see a quantity of dark-brown crystals. If these are not easily distinguished by the eye, they are with a magnifying glass. While we cannot distinguish the presence of the coloring matter of the blood in the urine with the aid of the microscope, we may detect the presence of blood corpuscles in the fluid. We may also find by this means uric casts and epithelium of the kidneys, and small red granulations. These may be considered haemoglobin. As to the causes of this condition we will mention piroplasma.

Piroplasma Canis, Malignant Jaundice.—This is an infectious, not contagious disease, due to the presence of a protozoon, piroplasma canis, in the red corpuscles; this disease is generally found in warm climates, particularly South Africa; it is very rare in Europe.

Etiology.—The cause of this disease was first described by Piana and Gali-Valerio as a protozoon of the order of hemosporidia, and was carried into the blood of the dog by means of ticks—in France by the Dermacenter reticulatus, in South Africa by the Hemophysalis leachi, and in Germany and Hungary by the Ixodis ricinus reduvious. The disease appears about thirty-six hours after infection of the red blood corpuscles; the corpuscle being colorless, the protozoa can easily be recognized if the blood is fixed with absolute alcohol and stained with methylene blue (Fig. 99). The size of the parasite varies from 0.7 to 3.4μ. They multiply very rapidly, particularly when the fever is high. After the destruction of the erythrocytes, the parasites appear in the plasma, and are more rounded in form, and then they appear in greater numbers in the internal organs, particularly in the lung tissue, than in the blood. Transmission, either by subcutaneous or intermuscular injection of the defibrinated blood containing the parasites, reproduces the disease and the animals die in a week; recoveries are very rare. The blood if kept in a cool place retains its full activity for twenty-five days, in warm weather the infected blood loses its activity in fourteen days, at a temperature of 44° it loses its power in one and one-half hours, and at 50° in one-half hour. Young dogs seem more receptive of the disease than older animals; bitches which have had the disease give their puppies a certain amount of immunity from the disease.

Pathological Anatomy.—If the disease is very acute, and runs a short course, with the exception of the alteration of the blood, very little change is noticed. In more gradual cases there is anæmia, jaundice and great enlargement in the volume of the spleen—it is frequently found to be four times its natural size—hyperæmia of the liver, kidney and marrow of the bones, extravasations in the pericardium and in the lungs, catarrh of the stomach and of the intestines, especially the duodenum. In the kidneys, spleen, marrow of the bone, as well as the blood, numerous piroplasma are found.

Clinical Symptoms.—The disease occurs in both acute and chronic forms. The acute form is ushered in by listlessness, depression, want of appetite, and increase of temperature to 40-43°, and a few days later by a rapid fall of temperature to subnormal; the visible mucous membranes are cyanotic, sometimes yellow, icteric; the pulse and respirations are increased and frequently labored; the gait sluggish and staggering, and finally there is complete paralysis. The urine contains albumin and biliary pigment, and in the majority of cases from 3 to 5 per cent. of hæmoglobin. The blood is thin, light red, and coagulates very slowly; the number of erythrocytes is diminished by half, and the leukocytes are greatly increased in number. Death occurs in from three to ten days.

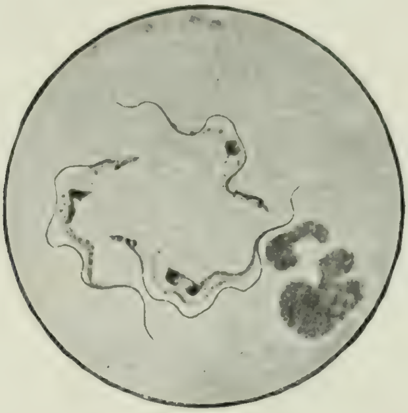


FIG. 141.—Trypanosoma Brucei. (*Hutyra and Marek.*)

In the chronic form the temperature is slightly increased or may even remain normal, the animal shows great muscular weakness, lassitude, want of appetite and rapid emaciation, urine contains albumin and biliary pigment, while hæmoglobin is rarely found, and there is a diminution of the red blood corpuscles and a corresponding increase of the white corpuscles. The duration of this disease is from three to six weeks; recovery is not at all rare. The diagnosis is easily ascertained by the presence of the piroplasma in the blood. Nocard suggests that where there is every evidence of the disease, but microscopical examination fails to detect the piroplasma, a young animal should be inoculated experimentally.

Therapeutics.—Experiments have shown that Trypan blue destroys Piroplasma canis. According to size, dogs receive from 2 to 20 c.c. of a 1% solution, intravenously. Cures have also been affected by the use of Trypan Red, Damholid, Salvarsan (0.04 per Kg. or 0.02 per pound weight). Fowlers solution has also been succesfully. Atoxyl was found ineffective. In regions where the disease is common, protective inoculation may be resorted to.

A disease similar to the above, Nambi uvu, occurs in Brazil. It is caused by Rangelia vitalii.

Preventive Inoculation.—When a dog has overcome the disease and become immune, the blood of this animal possesses the property of destroying the piroplasma; these immune animals are inoculated repeatedly with the virulent blood, and a serum is obtained which is used. Care must be taken to see that this serum retains its activity.

Trypanosomiasis.—The meaning of this term embraces a number of tropical diseases that are caused by intracellular parasites (blood parasites) of the Genus Trypanasoma (Protozoa, Flagellata). A number of these diseases, especially Nagana or Tsetse Disease of Africa and Surra of India have also been observed in the dog and are readily transmitted by inoculation. The parasite which is concerned in the etiology of Nagana is known as Trypanosoma Brucei, while the cause of Surra is Trypanosoma Evansi. These diseases are transmitted to horses, cattle and other domestic animals by means of the bite (so-called) of certain insects (Tsetse fly of Africa (Glossina morsitans), and tropical Gad fly of India, etc.) It is probable that dogs also become infected by feeding on fresh Nagana—or Surra—cadavers. Demonstration of the parasites in the blood is easy, their fish like bodies and lively serpentine movements being readily recognized with slight magnification. The most practical stain is methylene blue, or Romanowsky's method.

The Symptoms usually observed are: Elevated temperature with occasional abatement, edematous swelling especially of the rear extremities but later extending to the trunk, scrotum and face; pustulous eruptions of the skin which may result in complete alopecia; turbidity of the cornea; disturbance of coordinated movement and finally paralysis. Death usually results in the course of three or four weeks.

The principal remedies are Trypan Red, Trypan Blue, and especially the organic arsenic compounds, e. g., Atoxyl.

Leishmaniosis.—The cause of this disease which now and then makes its appearance among dogs, especially young dogs, in Italy, is a Trypanosome—Leishmania canis. This organism exists as a parasite in leucocytes and myelocytes as well as in the endothelial cells. Natural infection seems to take place through the medium of fleas and bed bugs.

The symptoms enumerated are: Irregular low fever, gradual emaciation, sometimes tumefaction of the spleen, ascites, occasional diarrhea, dyspnea, weakness of the hind extremities. Death follows in the course of months from complete exhaustion. Recovery from a light attack produces immunity. A disease similar to Leishmaniosis and observed in Italy on very rare occasions, is caused by Toxoplasma canis.

Streptothricosis.—Pseudoactinomycosis. These terms are applied to an occasionally observed lingering disease caused by Phykobacteracee Streptothrix canis (Actinomyces canis, Cladothrix canis Rabe) closely related to Actinomyces bovis. The mycelium of this fungus forms white granules of the size of a pin head that can be demonstrated in the pus and serous fluids (Fig. 142). The appearance of the disease varies. Not infrequently nodular swellings that are penetrated by fistulous canals, or abscesses with gray semi-fluid mucoid or mucopurulent contents appear on the legs, neck, flank or other regions of the body. In other cases these conditions are either preceded or followed by ill defined pleurites or peritonites with turbid, reddish gray exudates containing the above described granules. At times metastatic abscesses develop in the brain, liver or other organs. The animals finally die in a condition of cachexia. Treatment promises success in such cases only where surgical methods can be resorted to. Otherwise potassium iodide might be tried.

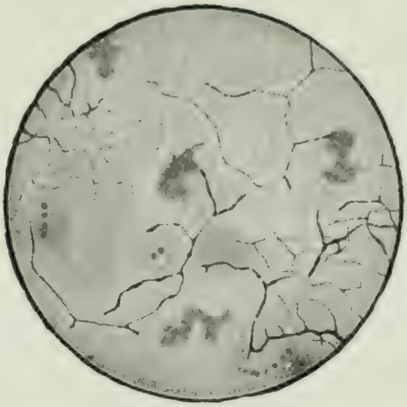


Fig. 142.—Streptothrix canis. Pleural exudate; Fuchsin stain. (*Hutyra and Marek.*)

Tetanus.

(*Lockjaw.*)

This is a specific infectious disease characterized by tonic muscular contractions and caused by the tetanus bacilli. These organisms are rather long, slender—from two to four microns long—with a globular spore at the end; this is larger than the bacillus and gives the latter a drumstick shape. The organism is strictly an anaerobe and is obtained in pure culture with some difficulty; morphologically it is difficult to distinguish from the bacilli of malignant œdema and systematic œdema (Ricketts). These spores possess great powers of resistance and are found in soil, particularly in garden earth and rich meadows, and in the excrement of healthy horses, dogs, cattle and other animals; this explains why animals are so prone to develop the disease from wounds of the extremities, tail, etc. When these microbes invade a wound they multiply with great rapidity and produce toxines which cause a strychnine-like convulsive contraction of the muscles. These toxines are taken up by the peripheral nerves and conducted to the central nervous system along their course. The virulence of the bacilli is in all probability influenced by the simultaneous invasion of other germs (pus producers).

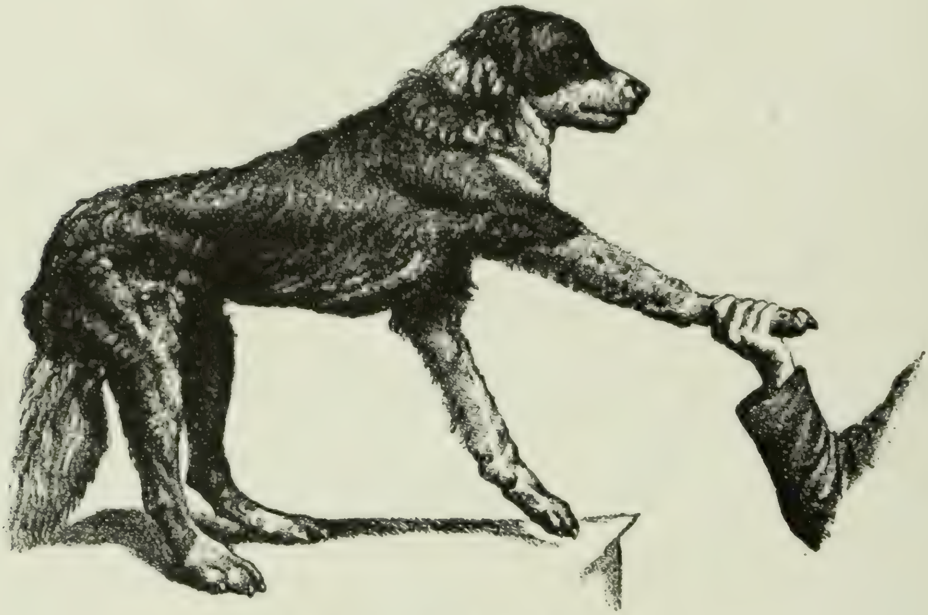
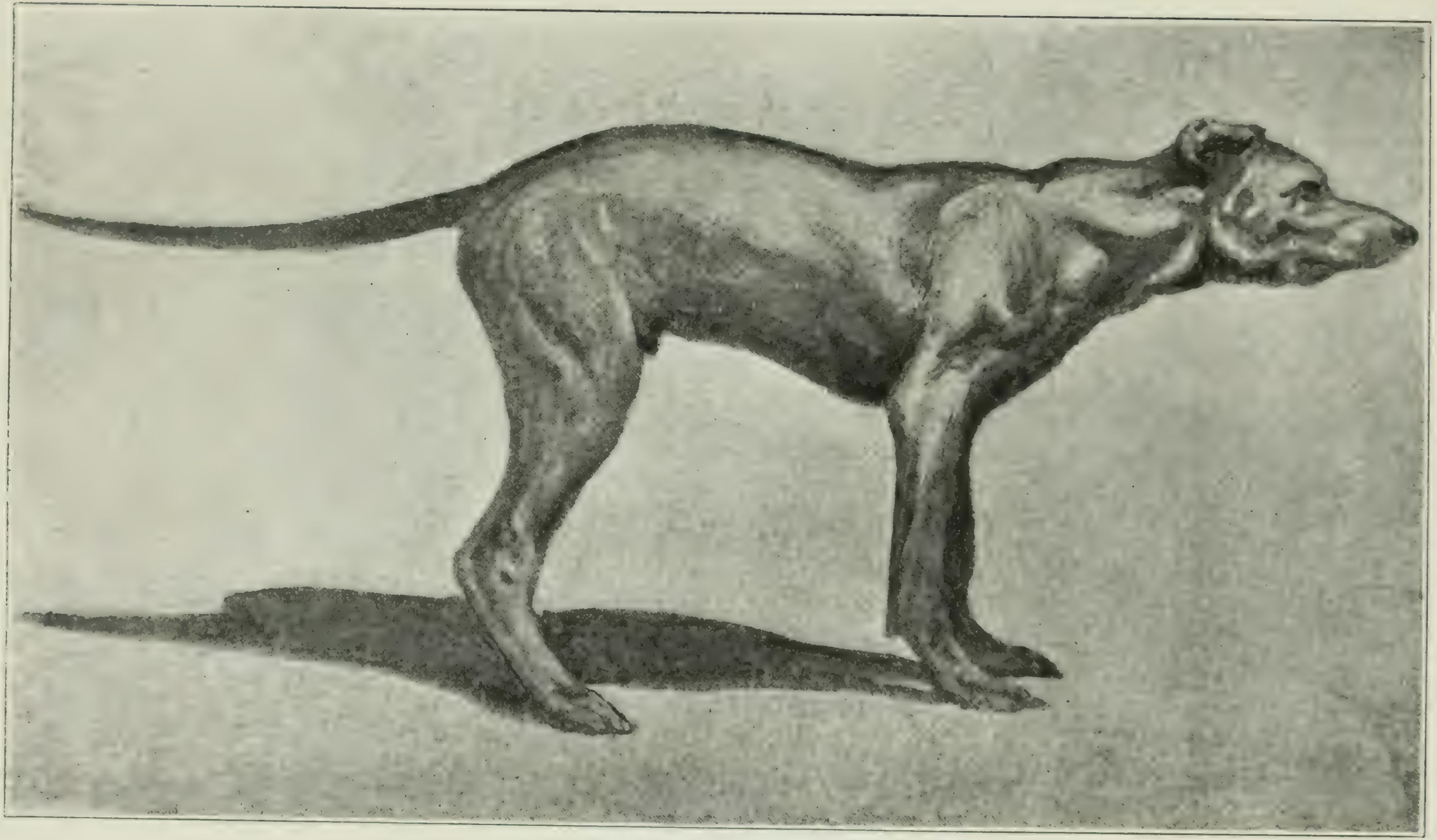


FIG. 143.—Dog with tetanus.

This very rarely occurs in the dog. The figure here presented (Fig. 143) is the only one the writer has seen, and was taken twenty-four hours before death; the muscles were contracted to such an extent that the animal could be lifted bodily by holding up one anterior limb. Tetanus may originate from a wound in any part of the body. No special class of wound can be said to be favorable to the production of tetanus. Thorns breaking off in the interdigital web and failure to remove ligatures after amputation of the penis are considered especially dangerous in this respect. It may originate from a scratch or from a very large wound. The temporary trismus seen in young animals that have eaten decayed meat should be classed under ptomaine poisoning, and



TETANUS (*lockjaw.*) *W. McDougall, del.*

not under tetanus. The anatomical examination is almost always negative; hyperæmia and congestion of the cord which is occasionally seen is of secondary importance as it seems to have no actual bearing on the true cause of the disease. Post mortem findings are usually negative.

Symptoms.—The period of incubation in a dog is not known positively, as the cases are so rare, but probably it is about the same as a horse—from four to twenty days depending probably on the virulence of the bacilli. The general symptoms are stiff stilty gait, the neck and head are extended, the expression is staring and anxious, the ears are drawn forward and pointed, the membrana nictitans is drawn over the eye, wrinkling of the skin of the forehead, retraction of the angle of the mouth, with difficulty in eating and drinking, the penis is erect and the muscles of the body are hard and outlined, the animal is nervous and anxious; the pulse and temperature are generally little altered. In one case there was an elevation of temperature; the case recovered. The duration of the disease is about a week, but it may vary. As recoveries are recorded from time to time, it cannot be regarded as always incurable.

Therapeutics.—The treatment is generally palliative. The wound must be examined and treated with antiseptics, and use such sedatives as morphine, dilute hydrocyanic acid, chloral; it must be remembered the most important matter is to keep up the animal's strength with easily digested food—scraped meat, beaten up eggs. Where the trismus makes it impossible to administer food by the mouth, it should be given in the form of nutritive clysters. The possible necessity of manual removal of feces and catheterization to remove retained urine should be borne in mind.

Tetanus antitoxin may be tried; the dose is 5 c.c. daily. Inject at, or at least near, the point of infection. Intravenous injections or intra spinal injections offer no advantages.

Foot and Mouth Disease.—This disease is occasionally observed in farm dogs and shepard dogs that have associated with infected cattle or other animals.

Symptoms.—Fever, occasionally vomiting and diarrhea; salivation, vesicles, followed by erosions and ulcers on the buccal mucous membrane; redness, swelling and vesicle formation on the interdigital web and balls of the feet, and attending lameness. In one case observed by the author the affected emaciated dog died at the end of a month from the effects of an uncontrollable diarrhea.

DISEASES OF THE BLOOD AND METABOLISM.

(Constitutional Diseases)

Microscopy of the Blood.—In a number of the diseases belonging to this division for diagnostic and prognostic purposes and in order to make possible rational therapeutics, an examination of the blood becomes necessary. This applies also to some other diseases. In the course of an ordinary practice a microscopical examination alone as outlined below will answer the purpose. For more detailed information reference must be made to special treatises on diagnostics.

The edge of the concha of the ear is the most suitable and convenient place for obtaining blood samples. After proper preparation of the field of operation a small incision is made at this place. When a larger quantity of blood is desired the vena saphena is punctured. In anemia the blood is conspiculously pale with only slight staining power, while in dyspnoeic conditions and fever (usually also in hemaglobinuria) it is correspondingly dark. It is of a dirty, brownish red color in advanced methemaglobin formation and cherry red in carbon monoxid poisoning. In leucemia it is pale red or chocolate colored (as though mixed with milk), and more or less transparent (varnish like) when seen in a thin layer by transmitted light, in icterus and septicemia. Venous blood has the appearance of arterial blood in prussic acid poisoning.

For the examination of fresh blood the latter is dipped directly from the wound by means of a scrupulously clean cover-glass and inverted on a glass slide. Care being observed in both operations not to exert pressure on the blood specimen and proceeding immediately with the examination under a low power lens.

The red blood corpuscles or erythrocytes are recognized as circular, biconcave, yellowish disks of about 7m diameter and here and there forming rolls resembling stacked coins. The white corpuscles or leucocytes (in the general sense of the term) appear as transparent, unstained whitish globules and a general idea of the relative proportion of the two forms of cells is readily estimated. According to latest determinations one ccm of blood contains from 5 to 8,000,000 red and from 9 to 10,000 white corpuscles. Conspicuous paleness of the erythrocytes (oligochromenia) occurs in anemic conditions and occasionally in hemoglobinemia. Abnormal forms (pear, dumbell, club, spindel and star-shape, etc.) are observed in all serious anemias. Mulberry shapes and crenated edges result from drying of the specimen and are not due to poikilocytosis. Embryos of Filaria immitis in the form of very motile, threadlike worms about 0.25 mm. long and with long pointed tails, as well as Hematozoon Lewis, when present, can be recognized in fresh blood specimens.

More exact and detailed information regarding the conditions of blood cells may be obtained by examining **stained preparations.** Space forbids reference to the manifold blood staining methods. Giemsasaining, with methylen blue-methylazur-eosin and Panchrom-staining according to Pappenheim, are especially adapted for use by the practitioner. The specimens are first stained with acid eosin methylen-blue according to May-Gruenwald and then with Giemsa solution. The following blood constituents (disregarding the blood plates and certain other negligible structures) may be determined in stained preparations.

I. Erythrocyte Forms: Normocytes, i. e., erothrocytes without nucleus, of normal size and form, **Macrocytes** (megalocytes, gigantocytes) i. e., abnormally large erythrocytes without nucleus and apparently distended, and finally, Microcytes, i. e. very small erythrocytes. Macro-and Microcytes in addition to poikilocytes (see above) occur in severe anemias. Other pathological forms are—**Normoblasts, Megaloblasts** and **Erythrocytes** with **basophile granulations.** An increase in the number of **erythrocytes** (polycythemia) is an indication of true plethora; a reduction in the number of erythrocytes (oligocythemia) is observed in all anemias.

II. Leucocyte Forms: Lymphocytes or small mononuclear or uninuclear leucocytes are about the size of erythrocytes, a very large nucleus that has a distinct and often radially arranged chromatin structure that stains with the usual nucleus stains. Among 100 leucocytes from 15 to 40 are **lymphocytes.** If the number of lymphocytes is excessive we refer to the condition as hyperlymphocytosis or simply as leucocytosis. **Monocysts** are large mononuclear leucocytes which are recognized as very large cells with oval or slightly indented eccentric nucleus. Normally there are about three monocysts for every 1,000 leucocytes. **Polynuclears, Neutrophiles,** are finely granulated leucocytes, exceeding the erythrocytes in size and contain a peculiarly twisted or **doubled up** nucleus, often in the form of an "s". These constitute the majority of the leucocytes—50 to 77% of all leucocytes being polynuclears. **Eosinophiles, Acidophiles,** are coarsely granulated leucocytes, much larger than erythrocytes and contain easily recognized, coarse, shiny granules in their protoplasm. These amount to about 4% of all the leucocytes. **Basophile leucocytes** or **mast cells** are white cells with coarse round granules in their protoplasm which differ from the granules in eosinophiles or acidophiles in that they do not stain with acid dyes but require basic stains. They occur only occasionally and amount to about 0.04% of the total number of leucocytes. Besides the above enumerated normally appearing cells of the blood there are a few others.

for instance the myelocytes (marrow cells) and their varieties and—myeloblasts.

An increase of leucocytes in the blood is called **leucocytosis.** According to the special forms that predominate the following forms of leucocytosis are recognized: 1. **Lymphocytosis** (lymphatic leucocytosis), i. e. an absolute increase in the percentage of lymphocytes is found, aside from other conditions, in convalescens following acute inflammatory infectious diseases, certain poisonings, pseudo-leucemia and, in most pronounced form in leucemia! 2. **Monocytosis,** i. e. an increase of mononuclear leucocytes beyond the normal is observed as an accompaniment of lymphocytosis. 3. **Neutrophilia** (neutrophile leucocytosis) is characterized by an increase in the number of polynuclear leucocytes and occurs as a pathological condition in the course of infectious diseases, intoxication diseases, suppurations, etc. Neutrophilia is a normal physiological condition during digestion; following exertion; and during the period of pregnancy. 4. **Eosinophilia** or eosinophile leucocytosis, an increase in the percentage of eosinophiles, has been observed in helminthiasis, artificially produced trichinosis and other affections. 5. Increase in the number of **mast cells** beyond the normal proportions has no special significance as far as at present known. For further information consult chapter on Leucemia.

A decrease in the total number of leucocytes (hypoleucocytosis, leucopenia) is observed in the acute stages of infectious diseases and intoxications (poisoning), in the presence of malignant tumors when the latter are generalized and in the death agony.

Other conditions that may be recognized in the examination of blood preparations are: the presence of Piroplasma canis in the form of pearshaped or roundish parasites in the interior of the erythrocytes, Trypanosoma inhabiting the blood plasma and Bacteria. The presence of Filaria has already been mentioned.

Anemia.

The term anemia is used to designate either a diminution of the total amount of blood in the body (oligemia) as observed after hemorrhages and severe diarrheas or a diminution of the relative number of red corpuscles in the blood (oligocythemia), a knowledge of the latter being very important in prognosis and treatment of the less acute and of all chronic diseases. Sometimes, also, it may be of importance to determine the hemaglobin content of the blood or the staining power of the latter.

Etiology, clinical symptoms and therapeutics.—We distinguish between an acute and a chronic form of anemia. The former is represented in its purest form after hemorrhage. The animals are faint and weak, have a draggy way of walking and easily collapse. The mucous membranes and the skin of the unpigmented regions of the body (belly, flank, inside of hind legs) are pale. The heart action is tumultuous, the pulse small, rapid, hard and finally imperceptible. Respiration is rapid, heart tones just barely audible. The surface of the body is cold, beginning at the peripheral portions. Clonictonic convulsions precede death. These symptoms apply also to internal hemorrhages. Treatment of acute anemia demands above all proper and effective checking of the hemorrhage and avoidance of its repetition. These precautions taken, intravenous or subcutaneous injections of physiological salt solution may follow. Subcutaneous injections of spirits of camphor may be necessary to counteract the weakening effect upon the heart.

Chronic Anemia.

Chronic anemia or anemia in the restricted sense of the word occurs especially in young, pampered dogs of the more refined breeds and in these cases usually results from deficient nutrition, e. g. early weaning and withholding of meat diet in growing dogs. More rarely it may be due to unfavorable, damp quarters, insufficient exercise, etc. It may be congenital (offspring from weakly or improperly nourished bitches) or possibly due to defective development of the arterial system with undersized heart. Anemia also occurs in the course of numerous acute and chronic diseases or as a result of single severe hemorrhages or oft repeated small hemorrhages. Other causes are intestinal worms, blood parasites and certain poisons, especially specific blood poisons, or toxines. The symptoms are based on the reduction of the normal number of red corpuscles and the resulting general lowering of all vital processes. The skin and the visible mucous membranes in particular are conspicuously pale. The patients are weak, have a **loose,** straggling gait, tire easily, sleep much; pulse is small, weak and rapid; the temperature is frequently below normal, often normal and occasionally slightly elevated. Auscultation of the heart reveals a soft expiratory systolic sound. Respiration, like the pulse, is accelerated, and both are temporarily still further increased by psychic or bodily influences. Blood discharged from wounds or taken from the cadaver is lighter in color than normal and the same is true of the erythrocytes when viewed under the microscope, the latter being also diminished in number. In severe cases often referred to as pernicious anemia, we also find pathological forms of erythrocytes—poikilocytes, macrocytes, microcytes. The general condition of nutrition is not good, the muscles feel flabby, appetite poor and capricious. There is also, at least in the more severe forms, a certain tendency to dropsical conditions. Digestive disturbances aggravate the trouble. The course is chronic though proper treatment not infrequently is rewarded with recovery. See Dochmiasis and Piroplasmosis.

In the treatment of chronic anemia our first object, aside from the removal of causal indications, should be to promote blood formation. To this end easily digestible nitrogenous food should be prescribed, meat in small amounts at correspondingly frequent intervals, milk and eggs, bouillon and eggs, or some of the preparations referred to on page 320. The most valuable drugs are: iron preparations, e. g., Tinc. Ferri Pomati, Ferrum carbonicum saccharatum, Ferrum lacticum, Liquor ferri albuminati (teaspoonful doses), Blaud's pills (several daily), or, of the more recent preparations, Ferratin (tip of spoonful at a time), hemalbumin (tip of spoonful at a time), Hematogen (tea- to tablespoonful), Perdynamin (teaspoonful), etc. According to circumstances—poor appetite—bitter principles may be added. Arsenic may also be prescribed.

Tinc. Ferri pomat.	10.0
Tinc. Quin. comp.	20.0

M. D. S. 10 to 25 drops 3 times a day.

Liq. Kalii arsenicos.	3.0
Liq. Ferri albuminat.	30.0

M. D. S. 15 to 30 drops twice a day.

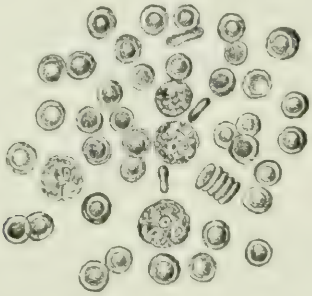


FIG. 144.—The blood in leukocythæmia.

Leukemia and Pseudoleukemia

The term **leukemia or chlorosis** is applied to profound affections of the blood forming organs with increase of the white and decrease of the red corpuscles. A characteristic of these affections is the appearance of certain forms of cells that either never appear under normal conditions or are present only in small numbers. Formerly a differentiation was recognized according to the supposed organ affected, viz., lymphatic leukemia (with swelling of the lymph glands) a lineal leukemia (with enlargement of the spleen) and a myelogenic leukemia (with pronounced changes in the bone marrow). At the present time the differentiation is based upon origon in the lymphatic tissue (lymphatic, or lymphoid leukemia [Lymphadenosis]) or upon origon in the myeloid tissues myeloitic or myeloid luekemia—Myelosis). The condition of the blood is the deciding factor. In both forms there is a considerable increase in the number of white corpuscles of the blood. The proportion, compared with the erythrocytes, in ordinary cases is 1 to 50, in very severe cases 1 to 10 or even 1 to 5. In lymphatic leukemia the lymphocytes and in myelogenic leukemia the polynuclear, eosinophile and basophile leucocytes are increased in number. In addition, myelocytes and myeloblasts are present in the latter form. When at all pronounced these conditions can be recognized microscopically. The blood appears very pale and sometimes looks as though it were admixed with milk; does not stain foreign objects (cotton or cloth) and, upon coagulation it separates into two layers, a lower layer of violet color, formed by the erythrocytes and an upper grayish white or milky layer formed by the fibrin and the leucocytes.

In addition there are symptoms of a greater or lesser degree of emaciation and characteristic changes in the spleen, lymphatic glands and bone marrow. The spleen shows changes most constantly. This organ is frequently enlarged to a very considerable extent, an increase in weight to two pounds or more being no rare occurrence. Feuereisen observed, in a medium sized bulldog a spleen that weighed over 6 pounds, the light red or pale brownish red surface of a section having the characteristic appearance of true hyperplasia. Occasionally we meet with circumscribed hyperplasia of the spleen, so-called leukemic centers of the spleen. As a rule, also, the lymph glands, either generally or only in certain regions are enlarged as a result of simple hyperplasia of the glandular tissue. The bone marrow is more rarely the seat of changes, appearing grayish red or grayish yellow, soft and smeary in consistency. Finally, diffuse or circumscribed proliferations of lymphoid tissue may be observed in the liver, kidneys, lungs, tonsils and other organs. Nothing is known concerning the cause of leukemia.

The term **Pseudoleukemia or Hodgkin's Disease** is applied to hyperplasia of the blood forming organs, especially the spleen and lymph glands when changes in the blood are absent, consequently no material increase of the white blood cells observable under the microscope (Aleukemia, aleukemic lymphadenitis, lymphosarcomatosis). Pseudoleukemia, the causes of which are absolutely unknown, is of more frequent occurrence than leukemia, and is now classified with the latter.

Clinical symptoms and course. The symptoms of pseudoleukemia correspond to those of leukemia. In regard to the difference in the character of the blood—see above. The detection of the enlarged lymph glands, especially when the latter are superficially located, meets with no difficulty. In all those regions where lymphatic glands occur we find roundish, more or less firm, painless tumors, easily movable, of smooth outline and non-sensitive to pressure. It is less common to find that the glands of only certain regions of the body are affected as described. The regions surrounding the affected glands may become edematous. Tumor of the spleen may be detected by palpation of the overlying abdominal wall with certainty in such cases only where there is considerable enlargement.

Other symptoms are—faintness, dullness, animals are easily exhausted, pale mucous membranes, conspicuously increased pulse, usually also increased respiration, gastric disturbances, progressive emaciation, dropsical changes, and occasionally hemorrhages in various organs. The course, as a rule is chronic; the animals sink lower from day to day and death follows in the course of several months. Cases of Pseudoleukemia sometimes take a more rapid course. The prognosis is unfavorable.

Therapeutics. The treatment of leukemic affections is along the same lines indicated for anemia. Aside from nutritious food the various iron preparations, arsenic and quinine, possibly also phosphorus. Recently Roentgen rays have been tried in man, injections of various preparations, water cures, in conjunction with radium, thorium-X and benzol internally (0.5 in capsules, several times daily).

Quinine ferro-citric	0.2
Sacchar.	0.6

M f Pulvis. D. tal dos Nr XX
S.—2 to 4 powders daily.

Capsul. gelatinos.

Benzol.	0.5

Replet, Nr L.
D. S.—3 capsules per day.

Diabetes Mellitus

Etiology.—By diabetes mellitus we understand a peculiar chronic abnormal condition of the urine which contains a large quantity of grape sugar. The true cause of this peculiar disease is not exactly known, but from recent observations which have been made on dogs and other animals this disease seems to have some connection with diseases of the pancreas. Minkowski found that on removal of the entire pancreatic gland, sugar appeared in the urine in twenty-four hours—the amount of sugar was 10 per cent.—and death in a few weeks. A removal of a portion of the pancreas caused slight traces of sugar in a short time, and if the greater part of the gland is extirpated, leaving only a very small portion, sugar was immediately formed in the urine in large quantities, and resulted in death in a very short time. Lepine seems to think the pancreas has the property of taking up the sugar in the blood and when this gland is destroyed or its functions become impaired in any way, the sugar in the blood is eliminated by the kidneys. This is further confirmed by diabetic dogs, where one part of the pancreas is invariably found to be atrophied, either from functional loss of power or from carcinoma. Gebier mentions a case of transitory glycosuria, where a bitch of a very affectionate disposition and accustomed to be with other dogs, when separated from the other dogs and confined by herself, immediately had sugar appear in large amount in her urine.

While this disease is not exactly rare, and is more frequently seen in old dogs, occasionally large number of cases may be seen in certain localities; sex seems to have no influence on the disease, as it is seen equally in both sexes. Eber found it to occur most frequently in small pet dogs that have little or no exercise.

Clinical Symptoms and Course.—The disease develops gradually; the most important symptom is the gradual emaciation notwithstanding the fact that the animal may have an enormous appetite and be fed with the most nutritious food. The animal is easily fatigued, is made to take exercise with effort, and in some cases moves about with more or less difficulty. The animal shows great thirst and drinks enormous quantities of water, at the same time passing large quantities of urine, which in most cases is pale and colorless and, as a rule, the specific gravity is particularly high (1030 to 1060) and it is only in very rare cases that the specific gravity is as low as normal. The odor of the urine is very characteristic; it resembles that of fresh fruit (aceton). The tests already described can be used to demonstrate the presence of sugar in the urine, the fermentation test being the best to use. Consult special works. The quantity of sugar present in the urine may vary in amount. Eichhorn states that in one case he found 11 per cent. and Haltenhof found 12 per cent. in another case. When an animal is fed on a pure meat diet it seems to lessen the amount of sugar in the urine, although there are certain cases where even this diet has little or no effect on the amount of sugar present. Albumin is sometimes found in the urine in this condition.

In many cases cataract may develop (opacity of the lens, gray cataract), appearing simultaneously in both eyes, causing total blindness, in some cases we find ulcerative keratitis. In other cases the hair falls out; vomiting, persistent diarrhœa, falling out of the hair, and some have noticed an inflammation and ulceration of the skin and bleeding of the mucous membrane terminating in chronic bronchial catarrh of the lungs. The course of the disease is gradual; emaciation and debility increase until finally the animal sinks into a deep coma, accompanied, as a rule, with convulsions, and finally death. The prognosis in all cases should be unfavorable. Post-mortem generally shows atrophy of the pancreas and hypertrophy and fatty degeneration of the liver.

Therapeutics.—The treatment of diabetes consists of feeding the animal on food which does not contain any carbon, or as little as possible. This may be accomplished to a certain extent by a meat-diet, and even this diet cannot be followed up for any great length of time. Give eggs and bran bread, vegetables and in cases where it cannot be avoided, milk; but wheat bread, sweets, sugar in the form of candy, cakes, rolls, rice, peas, lentils, potatoes, or any food containing starch in large quantity, must be avoided. A pinch of carbonate of soda must be given three times daily in the drinking water. Other preparations such as arsenic, salines, salicylate of soda, carbonate of ammonia or acetate of ammonia are useful. Where the animal is in a state of coma, use subcutaneous injections of ether or camphor in combination with the intravenous injections of normal saline solutions. It is always wise not to change the animal's abode, because animals sent to a hospital, affected with this disease, show the effects of worry immediately, by the increase of the amount of sugar, if sent away from their habitual surroundings.

Diabetes Insipidus.

This condition is a chronic one in which there is no elevation of temperature, and a marked increase in the amount of clear urine secreted, which is of a low specific gravity and contains no sugar. The animal is constantly thirsty, drinking large quantities of water. This disease is less frequently seen in the dog than diabetes mellitus and must not be mistaken for ordinary polyuria which is seen where an animal drinks very large quantities of water, or as a result of the administration of diuretics or certain poisons or spices, or from atrophy of the kidneys after the rapid reabsorption of extensive exudates or transudates. It is also seen in a more or less pronounced degree in convalescence of an animal from many acute diseases, and it is also observed in certain organic diseases of the central nervous system. In this last group of sympathetic diabetes belong the case described by Holzmann; this dog was a very much emaciated hound three years old, having a pale mucous membrane and rectal temperature of 38.° The animal drank 12.57 c.c. of water daily, and passed about 12.79 c.c. of urine. The urine was yellowish, had a weak acid reaction, its specific gravity was 1.006, and contained nothing abnormal. On post-mortem nothing of any great consequence was found, except a myxoma hyalinum, which appeared in the shape of a yellowish, transparent, coagulated mass between the periosteum and the dura mater, entirely surrounding the spine with the exception of a small portion of the neck. There was also some hyperæmia and slight bleeding in the gray substance of the lumbar region. Five elongated osteoid sarcoma masses were found pressing on the dura mater. Holzmann could not decide which of these two conditions was the true cause of the disease. If we eliminate polyurias due to some organic alteration of the cerebral nervous system, as a result of chronic interstitial inflammation of the kidneys, then polyuria is distinguished from diabetes insipidus by the fact that the former is transitory in its character, and still it is only by close observation, lasting for some time, that we can distinguish between the two conditions; polyuria lasts only for a short interval and does not produce any great tissue changes, whereas, diabetes insipidus gradually progresses, becoming chronic, and is accompanied by great emaciation. The urine is pale, of low specific gravity, and contrary to chronic nephritis, contains no albumin. In all the cases observed by the writer which he took at first for genuine diabetes insipidus, he found where he could follow them closely, that after some time the polyuria and increased thirst gradually disappeared. Schindelka described one case where the animal developed cataract and abscesses in different parts of the body, and other complications which are seen in diabetes mellitus.

Therapeutics.—The animal should be put on a strong easily digested diet and be more or less restricted in the quantity of fluid that it drinks; of course it is not only cruel but almost impossible to restrict the animal as to the quantity of water that it drinks if it is thirsty, but the food should be dry, and soup or other liquid foods should not be given. Medicinally the following drugs are recommended: bromide of soda, preparations of iron, opium, boldo root, antipyrin, ergot, extract of hydrastis, hydrastin strychnine and other vascular alteratives. Tannopin may also be tried. The treatment of symptomatic polyuria consists in attempting to remove the cause.

Extr. secal. cornut. fluid.	10.0

D. ad vitr guttat.
S.—10 drops morning and evening.

Ferr. sulfuric. sicc.	15.0
Sacchar.	10.0

Misce fiat pulvis.
D. S.—Tip of a teaspoonful in drinking water.

Obesity. Adipositas Universalis.

Etiology.—This disease is due to the absorption of large quantities of carbohydrates (over nutrition), and also to a lack of proper exercise, and in some cases as a consequence of improper oxidizing processes in the body. It may also be hereditary in some cases. This disease is especially seen in lap-dogs or pet animals, and is also noticed in bitches after ovariotomy, and in dogs that have been castrated.

Clinical Symptoms.—The common location of fatty deposits is in the panniculus adiposus, around the region of the abdomen, and surrounding the internal organs—for instance, in the mediastinum, the pericardium, and the capsules of the kidneys. The circumference and weight of the body increase very much, and round prominences form in different parts of the body, especially the neck, shoulders, back, and hips. The abdomen is round and distended. The animals are lazy, dull, awkward, and tired on the slightest physical exertion. When this condition becomes very marked, and there is a large deposit of fat in different parts of the body, especially when it has accumulated in the thorax and neighborhood of the heart, we have a lessened heart-action and more or less difficulty in respiration, sometimes from the pressure of quantities of fat on certain blood-vessels, decreasing their size and thus requiring greater effort of the heart's action, until finally the heart becomes overtaxed, and we have symptoms of heart-failure, bronchitis, chronic catarrh of the stomach, and œdema.

Therapeutic Treatment.—The most important factor in the treatment of obesity is abundant and regular exercise in the open air and restricted feeding, the food must be albuminous, and fat and carbo-hydrates avoided. Sugar in any form, candy, sweets, etc., must be prohibited. Meals must be given at regular intervals, in a young dog three times daily, a dog over a year, two meals daily; a small meal in the morning and the good meal at night; dogs that have very little exercise, one meal daily is sufficient, and as a rule they seem to do very nicely on it. Slight laxatives, especially the salines, such as Apenta, Hunyadi, or Veronica waters, in teaspoonful doses once daily, and a pinch of phosphate of soda in the morning. There seems to be some value in the administration of the preparations of the thyroid glands (thyroid, thyroidin, or iodothyrin tablets), these tablets contain the equivalent of 0.3 of fresh thyroid gland and are to be given according to the size of the animal, from 1 to 3 tablets daily. Seven dogs were treated with thyroidinum depuratum in doses of 0.15 daily, and in from one to four weeks the animals were reduced in amounts varying from 350 to 3460 grams. But these preparations must be used with great care, beginning with a very small dose and gradually increasing it. Iodide of potassium, boracic acid and borax are not to be recommended as they are apt to cause disorder of the digestion.

In man the term **scurvy** is usually applied to an endemic or epidemic (rarely sporadic) cachectic disease characterized by spontaneous hemorrhages and peculiar affection of the buccal mucous membrane. Although there is now no longer any doubt that the disease occurs in dogs, it is equally certain that it is of extremely rare occurrence. Most of the cases formerly described as scurvy were probably common ulcerative stomatitis which was described in the older text books as scurvy or pseudo-scurvy. Some of these cases might have been identical with "Stutgarter Hundeseuche" or certain septic or toxic conditions as for instance meat poisoning. The symptoms are given as hemorrhages of the skin and mucous membranes, swelling, loosening, discoloration and necrosis of the gums; loosening and dropping out of the teeth; carrion-like odor from the mouth; salivation, foaming, etc.; epistaxis and vomiting of blood; bloody urine; great weakness, etc.; emaciation. Hemorrhages into the anterior chamber of the eye and of the retina have also been recorded. Therapeutics demand—in addition to treatment of the local lesions in the mouth, proper diet and tonics. Iron preparations and bitter principles are recommended. When there are severe hemorrhages internal administration of ergot or supra-renin would be indicated.

Hemaglobinemia. Hemaglobinemia, i. e., the presence of free hemaglobin in the blood plasma is the first stage of hemaglobinuria, the causes of both conditions being the same. In addition to the characteristic changes in the urine the principal symptoms are chills, fever, extreme bodily weakness, difficulties of respiration, icterus, and the symptoms of the primary disease. Therapeutics are governed by the cause. If the latter was exposure to sudden cold application of vigorous friction to the skin, wrapping in warm blankets, fango packs over extensive surfaces of the body, administration of hot elderberry blossom tea or tea made of dried linden blossoms. For other methods, etc., see chapter on nephritis.

Hemophilia. Bleeding Disease. This term is applied to a condition where there is chronic predisposition to persistent hemorrhage. Even slight wounds may result in hemorrhages that are difficult to stop. The slightest contusions may result in extensive bloody effusions or hematoma. It seems certain that this condition occurs in dogs although it has only rarely been observed. The author has observed only a single but nevertheless very characteristic case. Treatment consists in the administration of external and internal stiptics. For continuous application lime preparations are best.

Morbus maculosis. This is a comparatively rare disease in the dog in which petechiae and ecchymoses of the skin and connective tissues, swelling of the gums, albuminuria, hematuria and great depression occur and are observable intra vitam. Post mortem findings are blood extravates in the mucous membranes of the stomach and intestines, congested liver, enlarged spleen, and hemorrhages in the cortical regions of the kidneys. Friedberger described a condition in the dog which resembled Morbus maculosis Werlhofii of man. Stoeltzner observed a condition related to Moeller-Barlow Disease. The latter is a disease of children and is more akin to rachitis than to scurvy. Concerning further information regarding uremia the reader is referred to Uremia and Blood Parasites.

Priessnitz's Bandage or Compress.

This compress is mentioned a number of times in the work, and as it has special advantages in the treatment of dogs, the translator will attempt to describe it, as the author has not done so, probably due to the fact that it is so very well known in German therapeutics that it needed no explanation, but to English-speaking veterinarians this is the reverse.

The object of the compress or bandage is to keep up a continual heat, either dry or moist, to certain parts of the animal's body. We first apply against the part affected a piece of absorbent cotton, thick wool, or dry felt; or if moist heat is required, it is soaked in warm water or a medicated solution and wrung out to remove the excess of fluid; this is then held in position by a covering of some light material—a wide bandage of cheese-cloth is the best—and next a layer of oiled silk or rubber cloth (the object of this is to retain the heat and in case of a wet compress, the moisture), and finally over this is placed a compress or bandage of flannel. This last is to prevent loss of heat by radiation. Sometimes the inner layer of cheese-cloth is omitted, or else it is put on the outside of all.

The above procedure may seem to the hurried practitioner a rather long and unnecessary method, but after one has tried it and found the great advantages it has in the retention of heat, especially in diseases of the lungs, in hastening the maturing of an abscess, or in the lessening of a tumefaction by the constant and direct application of heat and moisture, he will realize its benefits.

DISEASES OF THE ORGANS OF LOCOMOTION.

DISEASES OF THE BONES.

Rachitis.

(*Rickets.*)

Etiology.—The different theories which have been advanced concerning the origin of rachitis do not seem to answer in all cases. These theories are as follows; it is due to a deficiency of lime-salts as a consequence of disturbances of digestion; to excessive formation of lactic acid, in the blood and to salts of potassium in the milk or to a lack of hydrochloric acid in the gastric juice, which would dissolve the lime-salts; an alteration of the general nutritive condition on account of abnormal influences in young animals; inflammatory hyperæmia and an increase in the number and size of blood-vessels in the osteogenetic tissues, so that the lime-salts continue to circulate in the blood instead of being deposited in the bones. None of these theories stands the test of close observation, we therefore do not know positively anything relating to the character and origin of rachitis. It is, perhaps, better to admit that it is a specific etiological change (which has not as yet become positively known). We know positively, however, that rickets can be developed in the dog by deficient, improper food, by want of meat, and especially bones, as it has been demonstrated that animals with this disease if given these articles of diet seem to improve immediately. Insufficient food to the bitch during gestation, or trying to raise too large a litter, or early weaning, improper food, keeping animals in cellars or in dark, damp places are all factors that tend to cause rickets. A proper amount of exercise is especially important for puppies kept in a small place.

Rickets generally appears in young animals in the first few months of their life. It is often hereditary, as is frequently seen as a result of very close breeding and also in breeds where color or conformation is the chief object, such as bull terriers, collies, or great danes, and where a breed is not old enough to be established, as Boston terriers. The symptoms appear relatively in proportion to their growth. If the puppy grows quickly, rickets appears quickly; if it grows slowly, the disease comes on gradually.

Pathological Anatomy.—Rickets consists of a peculiar disturbance of the bones of the whole system, which can easily be distinguished on looking at the animal. It seems to be due to a deficiency of lime-salts in the bones, making them soft and flexible. At the same time the nutritive process in the periosteum seems to be changed. The bones are light and soft enough to cut with a knife, and the epiphyses of the long bones are very much thickened; the marrow and periosteum are reddened. When the periosteum is forcibly removed from the bones of the animal in this condition, certain portions of the bony tissue come away and remain attached to the membrane. This is especially noticeable between the epiphyses of the vertebræ. The inner layer of the periosteum is thickened and the diseased tissue seems to have undergone a spongy degeneration. Inside of the bone we find it soft and cavernous. In the normal dog the bones of the skull are joined evenly, but in the rachitic dog interosseous spaces (fontanels) have been found.

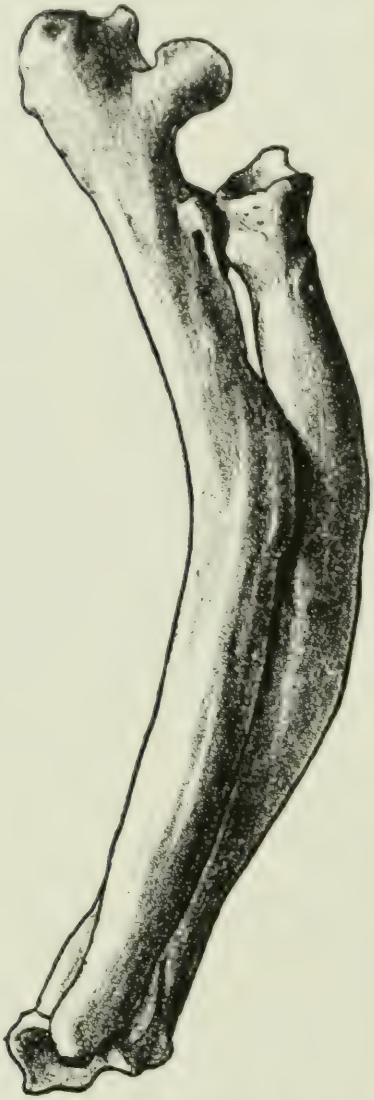
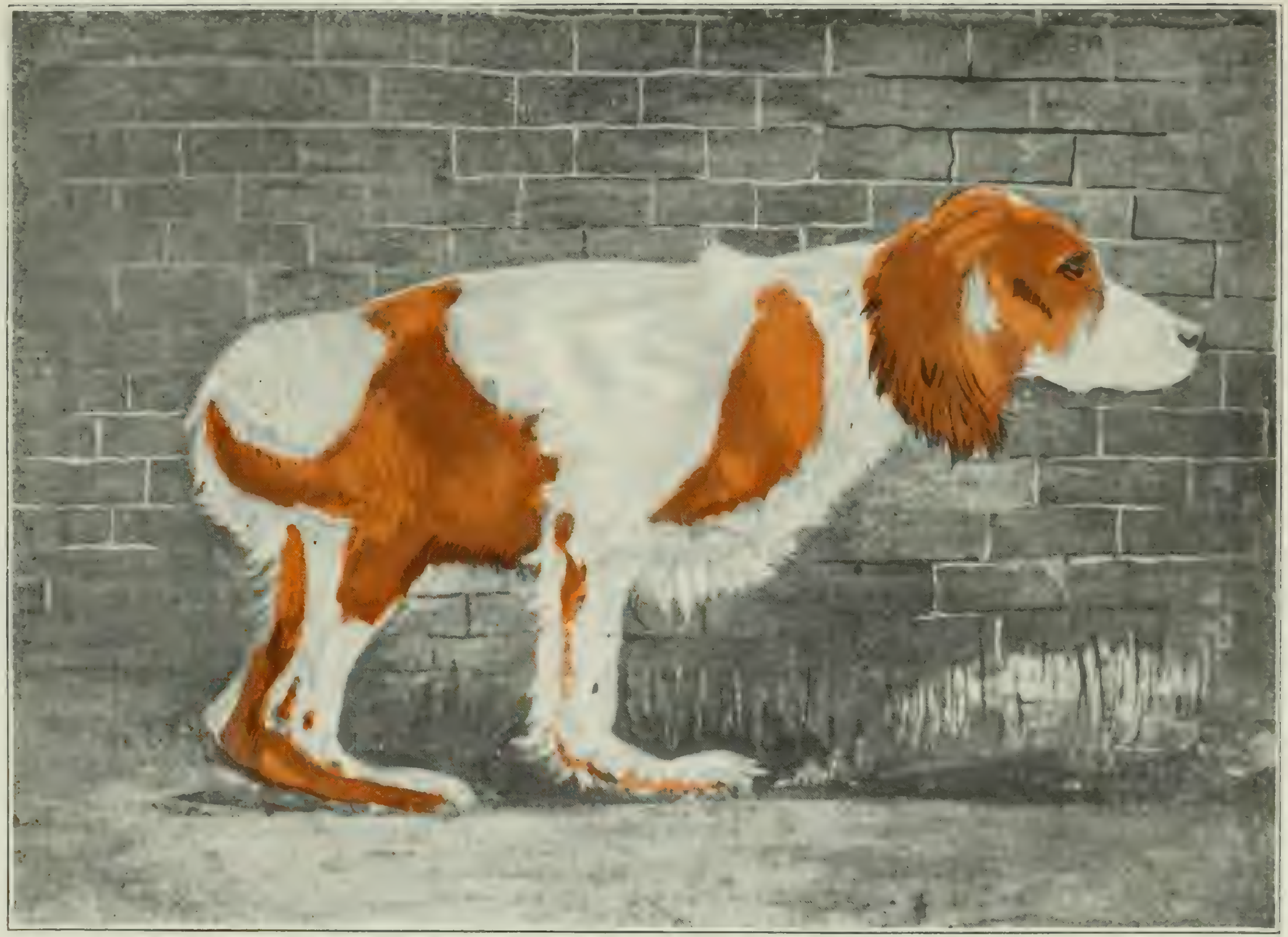


FIG. 145.—Radius and ulna of a dog affected with rickets.

Clinical Symptoms and Course.—Omitting the animals that are born with rickets, the first appearance of rickets is gradual, and generally the veterinarian is not consulted in the early stages, but only when the skeleton shows marked alterations of form, especially the bones of the extremities and back. The animals are dull, walk very carefully and with more or less effort, have no desire to run about, but lie down as long as they can. We find periosteal alterations in the frontal bones and bones of the temple, so that the head shows a peculiar marked alteration in conformation. Schutz has found that in rachitic animals the bones of the skull are extremely thin and the sutures separated. In the thorax there is a weakening of the walls of the chest, and the animals present that one-sided or "chicken-chest" condition. There is a peculiar knot-like swelling of the ribs both at their upper extremities where they unite with the vertebræ, and in their inferior extremities where they unite with the sternum and false ribs.

In this latter condition there forms a series of small, round nodules known as "rachitic rosary." In acute forms of this disease the spinal cord is twisted or bent in different directions (kyphosis, lordosis or



RHACHITIS (*rickets.*)

skoliosis). The most striking alterations are observed in the extremities. The long bones are thickened at both ends and bent on account of the softness of the bone and pressure of the weight of the body, when standing (**Fig. 146**). The upper portion of the front legs bends inward, rarely outward, and the animals have a peculiar, unsteady, awkward gait. They stand on the hind legs with the leg twisted under them, and in aggravated cases, the bones are bent in a circle, the bend of the astragalus coming down on the ground (Plate, Rachitis). As a consequence of the altered position of the bones, the ligaments become distended and stretched, causing an inflammation of the joints and consequently more or less enlargement of them. At the same time we observe emaciation, loss of appetite, and in some cases, catarrh of the stomach and air-passages, changes in the shape of the teeth, which are abnormally small and frequently devoid of enamel, or placed irregularly in the gums. The disease, as a rule, is chronic and the prognosis unfavorable. If the disease is taken early, it may be checked to a certain degree by means of proper feeding; but when the deformity is once formed, it is only in extremely rare cases that it does not show as the animal grows to an adult age either in the form of a peculiar bending or bow-legged appearance of the front legs, or a twisting, or show halt-shape in the hind-legs.

Therapeutic Treatment.—The treatment of rachitis consists of improving all the nutritive conditions and encouraging digestion as much as possible. Give the animal plenty of meat and bones (seafish), adding to them certain amount of phosphate of calcium, egg-shells, and limewater in the drinking water. Phosphorus, while medicated, generally causes irritation of the intestines. Improve the digestion as much as possible by tonics, nux vomica, gentian, etc.; keep the animal in a clean, dry place and see that there is good ventilation. If there is diarrhœa, give bismuth subnitrate. To avoid bending of the articulations, the animal must be prevented from taking unusual exercise, running, jumping, etc. Splints are sometimes used to correct the curving of the long bones.

℞. Ferri lactis 5.0
Calcium phos.,
Calcium carbonate,
Saccharum lactis, āā 20.0
F. M. pulv.

Sig.—One small teaspoonful in the food twice daily.

Phosphor. 0 01
Ol. Jecoris Asell 100s
M. D. S.—1—2 teaspoonfuls.

Osteomalaciae. Softening of the bones. This seems to be very rare in the dog. The author observed but one case, in a lean six-year-old terrier, that had a history of having for some time suffered from rheumatism of progressing severity and difficulty in mastication. The condition of the maxillary bones, in particular, was characteristic. The latter were so soft and flexible that the rows of teeth on either side of the jaw, upper as well as lower, could be forced into contact with each other, just like so much rubber. X-ray views showed up the teeth absolutely independent of any supporting bony structure. Treatment is the same as that for rachitis.

Fractures of the Bones.

By a "fracture of the bone" we mean a breaking or disunion of a bone or a bony cartilage; fracture is quite common in the dog, particularly the bones of the extremities, femur, radius, tibia and fibula, ulna and humerus and metacarpus and pelvis being the commonest, less frequently seen are the metatarsus; the sternum, ribs, cranium, vertebræ, and scapula are very rarely seen.

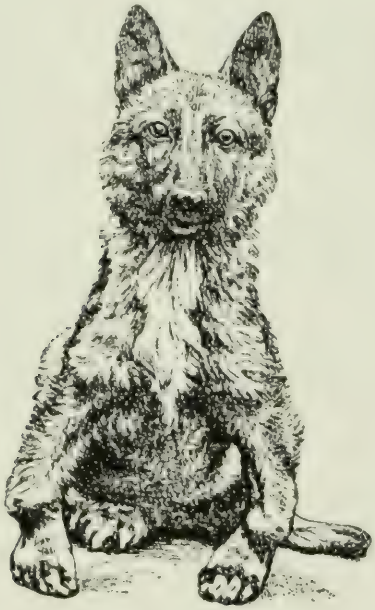


FIG. 146.—Six-weeks-old rachitic dog.

Etiology and Prognosis.—Most fractures are caused by external forces, and the bone fractured is at the region where the force or shock has expended most of its force—for instance, from blows or being run over, hit with a stone, or in some instances a fracture may be some distance from the region where the greatest amount of force has been made, such as falling for some distance, or concussions. We also see fractures of small projections of bones caused by great muscular exertion. Very old and very young dogs have a predisposition to fractures and rickets, or a tendency that way may also produce fractures from a weakened or softened condition of the bone.

We separate fractures under different names according to their position, severity, and the complications accompanying them.

In the first class belong infractions, splits or cracks, impressions or depressions.

In the second class belong oblique, transverse, longitudinal, and fissure fractures.

In pups the epiphysis and diaphysis are sometimes fractured through the symphysis, due to traumatic influences. This fracture, which is rather common, especially in the humerus and radius, is always confined to the immediate neighborhood of the symphysis. The general course of these fractures is the same as ordinary fractures, and no special mention is necessary regarding fractures of the soft bone, which in the young animal has not yet hardened.

The condition of the soft tissues in the neighborhood of the fractures and the amount of injury that they have had are of great importance in the prognosis. All fractures in which the soft tissues are not very much injured, and where the skin has not been torn, heal very much more quickly than those where there is an open wound extending into the fractured end of the bone. The first are termed simple fractures, and the latter, compound fractures. Where the fracture has involved a joint, it is called an intra-articular fracture. The compound and intra-articular fractures are very slow and difficult to treat, and present such symptoms as synovitis, either with or without serous or purulent inflammations. In such fractures, even when we have union of the broken ends of the bone, we may have as an after result a stiff joint or ankylosis from complications in the joint.

Clinical Symptoms.—The symptoms of fractures are generally indicated by partial or complete loss of the use of the whole or part of a limb. There is pain on pressure, deformity in the symmetry of the broken bones of that part of the body, and on moving the fractured ends there is a rubbing sound (crepitation) similar to rubbing two hard, rough surfaces against each other. The amount of loss of power in a broken bone depends to a great extent on the amount and severity of the fracture. This is very marked in fractures of the extremities; great pain on pressure, especially on the line of the fractured bones. This may also be of especial diagnostic importance in case of cracks or fissures of the bone. In such a case, while the symptoms are all present, the ends of the bones are not displaced. This is generally seen in the longitudinal form and in very young animals where the bone pivots on the fractured epiphysis. Crepitation and an abnormal movement are easily recognized by taking hold of the part above and below the fracture and moving it in different directions. Both of these symptoms are absent in incomplete fractures and in such fractures where the bones will close together with very little displacement. This is especially seen in longitudinal fractures of the short compact bones. We occasionally find a mild, rubbing bruit or sound produced by dry blood-extravasations or fibrinous coagulations between the surfaces of joints. In cases of fracture where the periosteum has not been torn, we will have a certain amount of swelling in the fractured region, pain on pressure, loss of appetite, and a certain amount of fever. This last symptom, however, is rarely noticed. When there is any uncertainty about the diagnosis it is well to have a skiagraph (X-ray) made of the affected part (Fig. 147).

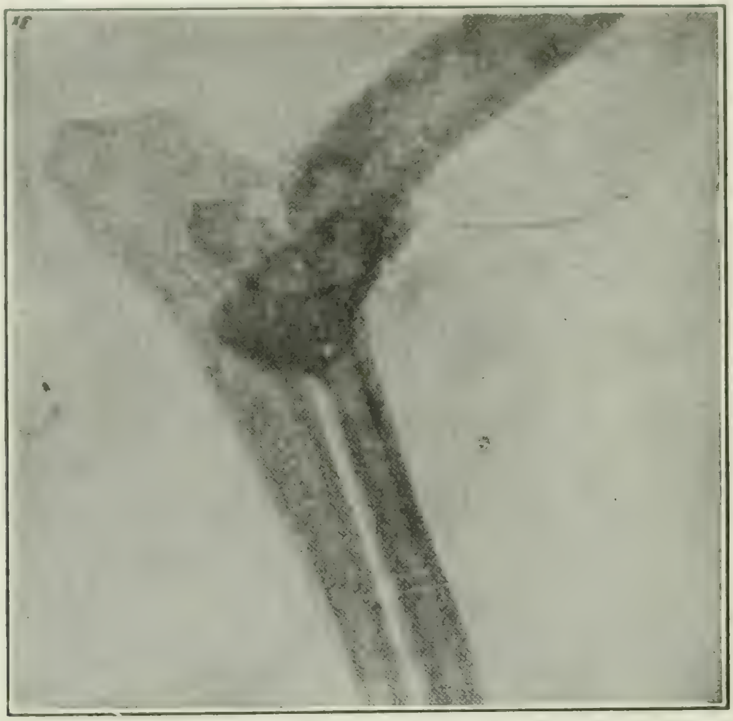


FIG. 147.—Skiagraph of fracture of the humerus.

Where there is an external wound which becomes rapidly closed by the blood and the purulent agents cannot penetrate between the fractured ends of the bone, we have a form of fracture that is not so difficult to treat; but if any septic materials should have penetrated into the wound and found their way between the ends of the bones, the condition is generally indicated in the following manner: There is a marked inflammatory swelling in the neighborhood of the wound. At first the discharge from the wound is blood-colored, then rapidly becomes pus-like, and finally purulent in character. If the discharge becomes obstructed in any way, we quickly notice a purulent, œdematous swelling all around the part, which is always a very grave symptom. If the course is favorable, the injured part becomes rapidly filled with red, granulating tissue, which finally dries, becomes hard, and forms a scab. By means of strict antiseptic treatment this is possible, and we can reduce the danger and time of an open fracture by strictly following the usual antiseptic forms of treatment. In the dog, however, this is always rather difficult to accomplish, as the animals are hard to confine, moving about constantly and pulling or tearing the bandages.

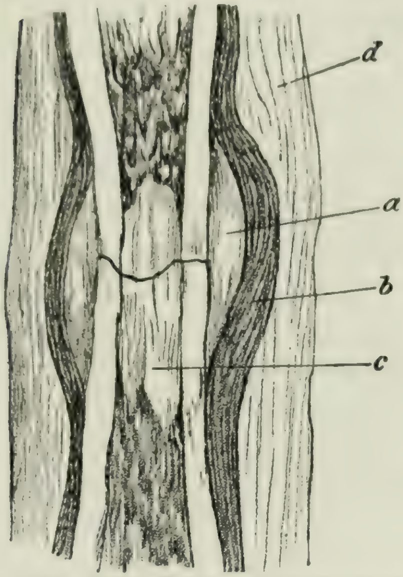


FIG. 148.—Diagram of union of fracture in the tibia of the dog: *a*, outer callus; *b*, periosteum; *c*, inner callus; *d*, inflammatory deposit.

The Phenomena of Union in Fractures.—The healing and union of the fractured ends of a bone are very similar to those of wounds, either by first intention (primum intentionem) or by second intention (secundum intentionem). In simple fractures we generally get union by first intention, and in compound fractures, unless the union be extremely small, we get union by second intention (Fig. 104). In both cases the union is accomplished by means of a callus growing around the ends of the bone—that is to say, a soft cellular tissue which forms an envelope surrounding the bone and gradually becoming hard through the ossific action of the periosteum and the marrow of the bones. The ring-shaped or external callus surrounds the fractured parts. This cellular tissue is formed of osteoblasts. The inner callus is formed by the marrow, forming a peculiar plug-shaped body and filling up the open ends. The periosteum is the true factor in making union between broken ends of bones. This is especially noticed in fractures where the periosteum is exposed, and where that envelope is torn or injured, union is almost twice as long as where the periosteum is preserved. The extravasation of blood found in the early stages of a fracture which lies in the surrounding parts does not in any way assist in the actual union, but helps to a certain extent in holding the bones together until the callus is formed. The callus, in the beginning, is a spongy mass, especially in bones containing a large quantity of marrow. This gradually changes into a bony cicatrix or callosity. This becomes thinner and denser, lessening in diameter, and finally becomes smooth on its surface, forming what is known as "final callus." Reabsorption commences at the same time until the body masses, which are useless after the bone is united, finally disappear, but there is always a certain amount of enlargement around the fractured ends of a bone at the point of union. Cracks and fissures undergo the same process.

Period of the Process of Union in Fractured Bones.—The time required to obtain complete union of a fracture—that is to say, until the animal can use the part without any pain or difficulty—depends largely on the size and position of the bone, the age of the animal, and the amount of use the patient makes of it. According to the observations of the writer and others, in fractures in which the periosteum is not torn, or simple fractures of the large bones containing marrow, the time is from eighteen to twenty-four days in adult healthy animals. Fractures of the ribs unite in from ten to fifteen days; in metacarpal and metatarsal bones, ten to eighteen days. In young animals the process is a few days shorter; in very old animals it is much longer. After the union of the fracture, as a rule, the affected leg is not used with as great freedom as it was before. This is especially noticeable in young animals that are growing. Very often there is a subsequent atrophy and impaired development of the muscles of that part. While this may be due to a certain extent to the inactivity of the muscles, when tied up in the splint, and also to pressure of the dressing, it is often noticed after the dressing is removed, and sometimes for weeks afterward, the animal walks stiff or is even lame; massage of the affected leg is useful.

Therapeutic Treatment.—In simple fractures the treatment consists of returning the broken ends of the bone to their proper anatomical position, and holding them securely in place.

The bringing together of the fractured ends of the bones must be done as soon as possible, and it is accomplished by pulling or extending them in a longitudinal direction until the fractured ends fit together. In some instances where the tissue is loose they have to be pressed back in their normal position. The animal should be held by an assistant while the operator manipulates the ends into position. In cases where there is extreme pain and in order to keep the animal from struggling, it is advisable to etherize, or better, give the animal a subcutaneous injection of morphine. In such cases as fractures of the metacarpal bones, bones of the face, etc., reduction can be made without an assistant. When the bones have been placed in position as near as possible to their normal shape, we must then apply a dressing which will keep the fractured ends in their position until they have united.

The best dressing for fractures in dogs are those which dry rapidly, such as plaster or silicate of sodium solutions. In some cases it becomes necessary to apply a temporary splint apparatus for a few days. This temporary splint apparatus must be used where there is great swelling, or where the condition of the wound or part would lead you to expect much swelling. The writer finds the best thing for fracture dressings is a broad pasteboard splint. This should be dipped in water and kneaded by the hand until flexible. There are various other materials for making splints—gutta-percha, wire gauze, spongio-piline, felt, sheet tin or zinc, wood, etc. In some cases where there is an open wound wire gauze may be used, fastened above and below the fractured ends of the bone, leaving the wounds exposed. This gives it sufficient support, and admits of proper antiseptic methods being followed. A plaster-of-Paris or silicate of sodium dressing may be applied immediately after the frac-

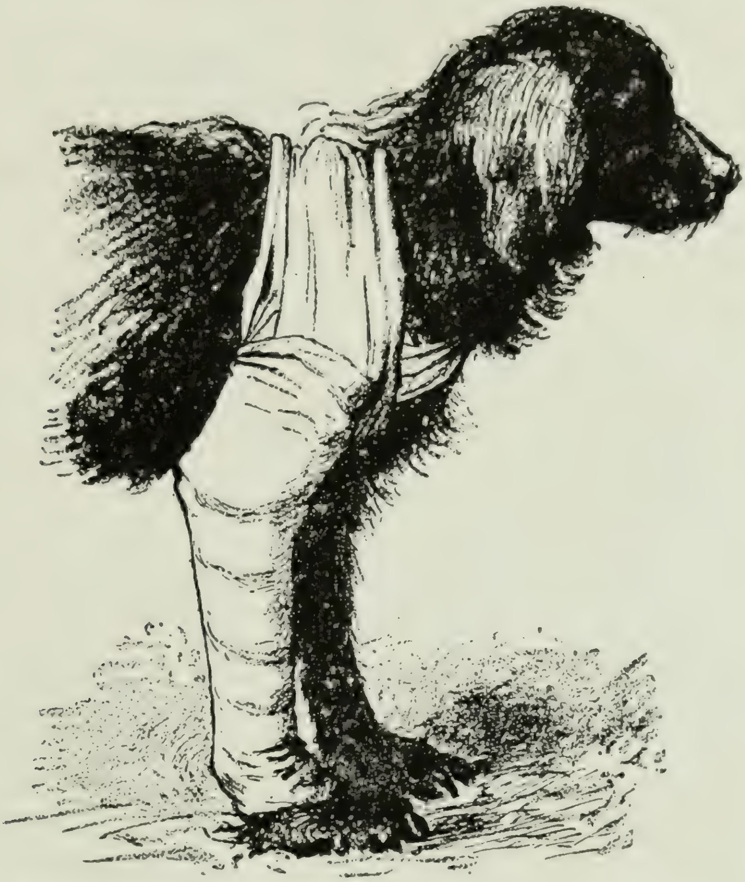


Fig. 149.—Plaster splint on fracture with support around body.

ture, provided there are no wounds. Where there are wounds or swellings we must wait until the swelling is absorbed.

We apply a permanent dressing, or a temporary dressing may be put on in the following manner: Cover it thoroughly with cotton wadding and apply the ordinary bandage, taking care not to make it too tight. In plaster-of-Paris dressings, the ordinary gauze, crinoline, or cheesecloth may be used, and the plaster, in powder form, rubbed into the bandage while it is being rolled. Then rub a small amount of oil (sweet) into the skin about the point of fracture to prevent the bandage sticking. At the same time place the plaster bandage in water for a few minutes and then wrap it carefully around the splint, following the methods adopted in ordinary bandage rolling, being careful not to place it too tightly. Smoothe the water out of the part, making the bandage as level as possible. In some cases where you want a very stiff bandage, it is advisable to put a certain amount of plaster between the folds of the bandage and finally give a good coating over the entire bandage. After the dressing has been applied, the animal must be kept perfectly quiet for at least ten to twenty minutes to allow the dressing to become hard. A plaster dressing will dry and harden a little more quickly by the addition of a small quantity of alum or common salt; a little glycerine added to plaster makes it much harder. A pair of curved scissors are the most practical for the removal of the dressing. Tripolith dressing (a mixture of plaster-of-Paris and soot) can be applied in the same manner as the plaster. Its composition is said to be much lighter and it dries much more rapidly. Silicate of sodium dressing has the advantage of lightness, durability, and of being removed easily, but it has one disadvantage, and that is it dries slowly, sometimes taking a couple of hours. The writer likes this form of dressing best, and to overcome the drawback of slow hardening has placed thin layers of wire gauze between the dressings. Flannel may be used as an under layer. Another dressing is a mixture of benzoate of sodium and silicate of sodium. In fractures situated in the upper sections of the leg where the extremity is cone shaped, it is necessary to build up the bandage in numerous layers to give it body so as to hold to the position of the leg, in other cases the bandage should be carried around the body so as to make the bandage firmer (Fig. 149).

The starch bandage (common boiled starch) is very useful, easily made and can be used in the smaller dogs, the bandage being put on first in one layer, this carefully covered with the starch, this covered with a layer of muslin, then starch over this and finally the third layer covered with starch and allowed to dry. This bandage takes longer to dry than the plaster.

Pitch plaster bandages are put on those parts of the body where an ordinary bandage cannot be applied, as in fracture of the scapula, femur and humerus. The pitch can be spread on strips of coarse muslin, and heated and applied to the injured part (Fig. 151). Burgundy pitch 100.0 wax 50.0, mix this into a plaster. The dressing may be left in place until we feel sure that union has taken place. In cases where the dressing has been too tight, or if the patient shows restlessness, whining, crying, loss of appetite, or fever, indicating that something is wrong in the fractured region, the dressing must be removed at once (**Fig. 152**).

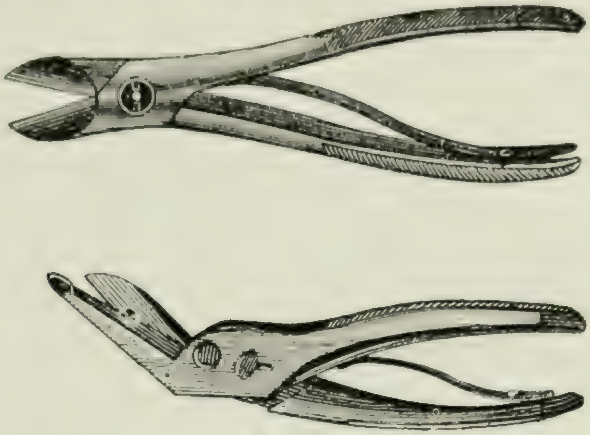


FIG. 150.—Forceps for removing plaster cast.

When the average period of union of fracture has passed remove the dressing carefully and see that the fragments are united. If we recognize any mobility in the fractured region, we then understand that we have a slow, callous formation, and nothing else is to be done but to renew the dressing as soon as possible, having first rendered the parts antiseptic by means of sublimate, soap and water. Put on the bandage again and let it remain for two or three weeks more. If we do not obtain a cure at the end of that time we may conclude that we have a false joint (pseudarthrosis).

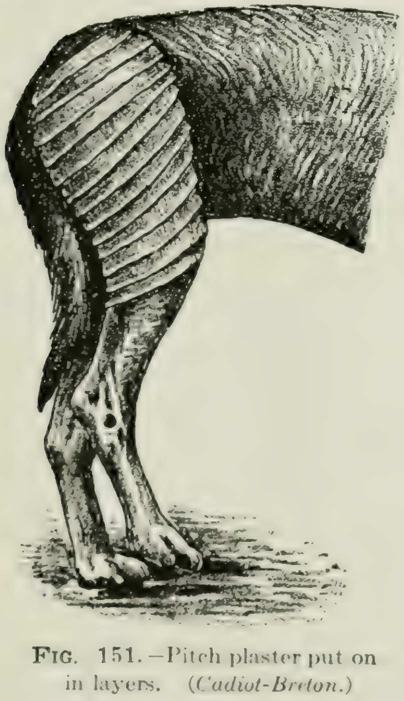


FIG. 151.—Pitch plaster put on in layers. (*Cadiot-Breton.*)

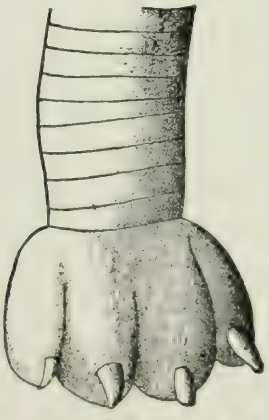


FIG. 152.—Effects of tight bandaging of a splint.

The methods pursued in man of introducing ivory or bone pins into the bone or screwing it together by means of clamps or resecting the ends with a saw, is hardly practicable in the dog. If, however, we discover that there is any danger of the formation of a false joint, we may daily irritate the ends of the wound by rubbing the broken ends together, and tying a thick elastic band around the leg above the fractured ends of the bone for one-half to one hour each day to allow an engorgement of blood around the fracture, this bandage should not be made too tight so as to interfere with the arterial circulation but sufficient to cause venous engorgement about the fracture; others recommend injections of 3 per cent solution of carbolic acid, or 60 per cent. of alcohol, and applying a dressing, giving the animal phosphate of lime or phosphoric acid.

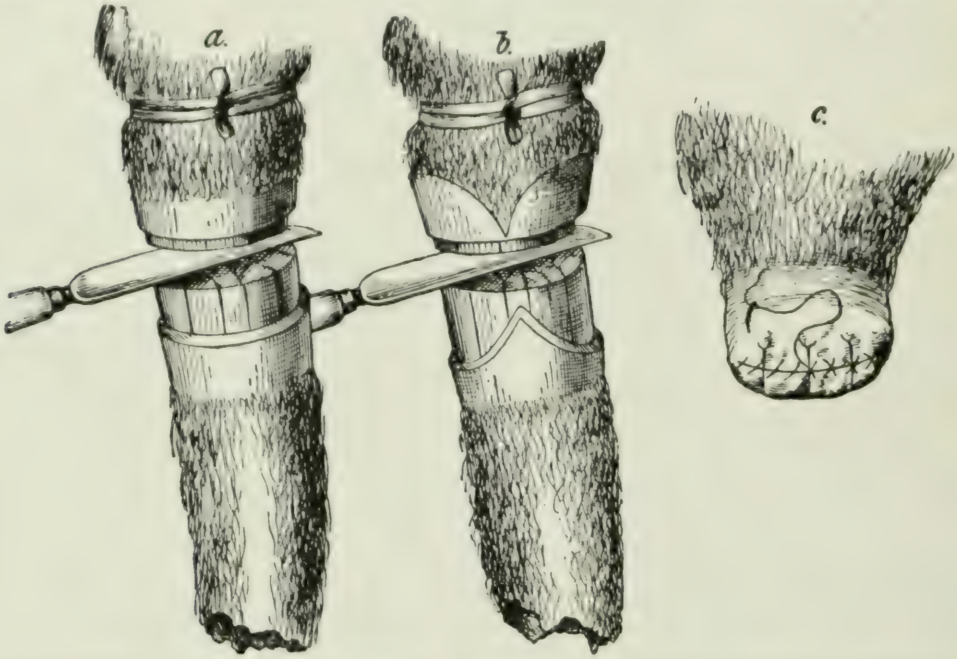


FIG. 153.–Different methods of amputation: *a*, straight section; *b*, flap operation; *c*, method of sewing the wound.

In complete fractures we follow the same rules as in the subcutaneous forms—that is to say, we endeavor in one way or another to hold the broken ends of the bone together while the wound is healing, and at the same time to dry up the wound with antiseptic applications. This is rather difficult to do in the dog, but it may be accomplished by making a "window" or hole in the dressing. The wound must first be thoroughly cleansed, dressed antiseptically, and then we apply a plaster dressing, according to the usual method, and place a piece of wadding upon the wound. When the dressing becomes hardened, we cut a hole over the wound by means of a probe-pointed bistoury, coating the edges of the opening with a small quantity of plaster-of-Paris or collodion in order to prevent the discharge of pus, etc., from running under the dressing.

The rest of the operation is performed according to the general rules followed in the treatment of wounds. In cases where the fracture is fresh and the wound is very small, we cover it with an antiseptic dressing (for instance, tincture of iodine and several layers of corrosive sublimate gauze). Then apply the closed dressing of plaster-of-Paris entirely over it. If the wound is slight, as a rule you do not have to remove the bandage. Care must be taken, however, to take the temperature and watch the leg to see if it swells, and if the animal is restless and uneasy. In cases where there is a wound and several broken bones, making a compound, comminuted fracture, the patient can only be saved by amputating the leg. Amputation of the leg, as well as exarticulation, has been performed a number of times in the dog, and generally successfully, the animals soon becoming accustomed to the loss of the leg, using the other three with almost as much ease as they did the four.

Amputation.—Before the operation clean the affected leg with soap and with a brush; then disinfect with powerful antiseptics (5 per cent. solution of carbolic acid, 1 to 1000 solution of corrosive sublimate, or 2 per cent. solution of creolin). In operating, the animal is put under ether or narcotized in some way; do so with as little loss of blood as possible. To accomplish this, use a rubber bandage as a tourniquet. All of the rules of antisepsis must be strictly adhered to, and at short intervals, during the operation the wound must be irrigated with some antiseptic. Avoid any serious manipulation or compression of the soft parts, The skin must always be cut in such a manner as to cover the stump when the two ends or flaps are united. All the vessels, arteries as well as the veins, which have been cut must be taken up separately with the forceps, and ligated with catgut or silk. All stumps of nerves which lie loose upon the wound are to be drawn out with the forceps and cut off as close as possible. The bandage must not be removed until all the blood vessels have heen ligated (Fig. 153). The wound and its neighborhood are then thoroughly irrigated with an antiseptic solution and closed with stitches, as illustrated on page 333, Fig. 153, *c*; and 367, Fig. 118, *a* and *b*. The whole wound is to be covered with a permanent antiseptic dressing. For further details, see Treatment of Wounds.

There are three methods at the disposal of the operator.

(1) **Amputation by Means of a Circular Section.**—Cut through the skin of the affected extremity to the fascia, making a complete circle around the member. Pull back the skin and have it held by an assistant, he pulling the skin toward the body as far as possible. It may be necessary in some instances to dissect a small portion of the skin and the cellular tissue from under the layer of the skin. After that make a sharp, clean circular cut, close to the edge of the skin which is pulled

back, amputating all the muscles, and then cut the bone with bone forceps (Fig. 108, *a*), or saw through the bone. While cutting through the bone it is necessary for the assistant to pull back the soft tissues as far as he possibly can toward the body, either with his hands of by means of a linen compress which has been dipped in an antiseptic solution. In cases where amputation of the extremities is to be performed, where there are two bones, as in the forearm, it is necessary to cut the soft tissues that are located between the bone.

Flap Amputation.—This is made by cutting two half-moon-shaped flaps of the skin and separating them from the fasciæ in which they are located as far as their base, turning them upward and backward. The muscles are cut close to the flaps, the tissues pulled back, and the bones sawed through and the ends of the flap carefully stitched (**Fig. 153,** *b*).

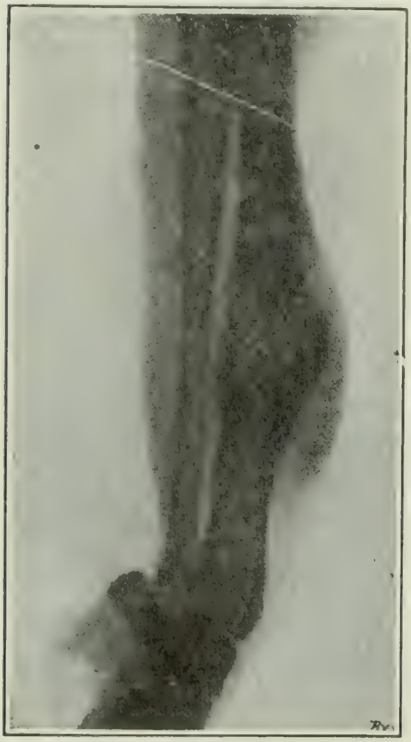


FIG. 154.

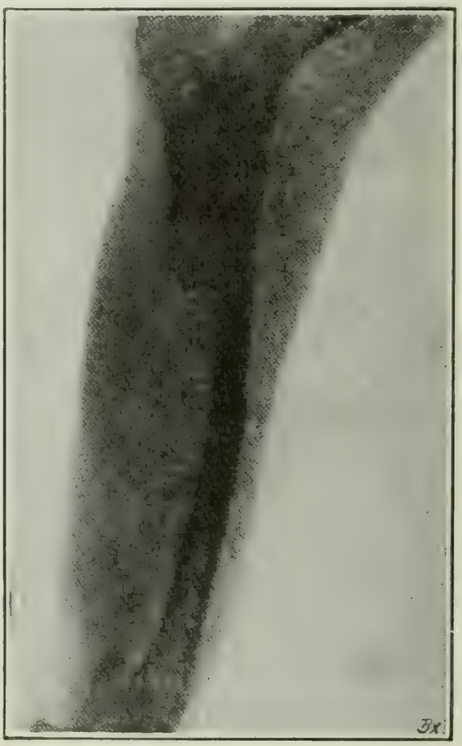


FIG. 155.

FIG. 154.—Skiagraph of osteosarcoma of the radius with opening in the upper part of the bone.

FIG. 155.—Skiagraph of the ulna with middle and lower third of the bone nearly gone.

Exarticulation.—Separate the soft parts exactly as in amputation by means of a circular or flap operation. Then open the affected joint by bending it, producing a tension of the ligaments which are located in front of it; then cut through them with a bistoury. To get quicker adhesion of the tissues it is best to scrape the cartilage on the face of the articulation. Exarticulation is finished by separating the other ligaments and the capsule of the joint; then proceed exactly as we do in ordinary amputation. The operation of removal of the tail is taken up later.

Minor Diseases of the Bones.

Other disease of the bones in the dog are of slight importance but the following are mentioned:

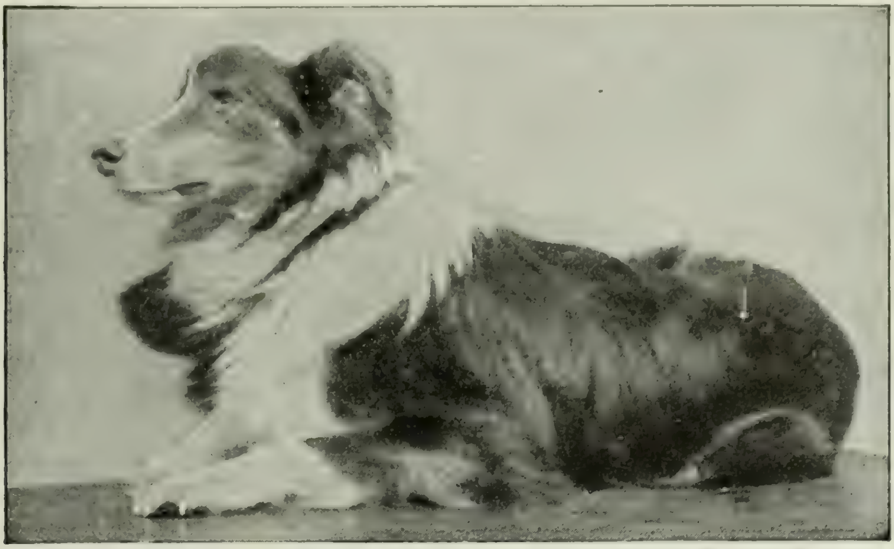


FIG. 156.—Osteosarcoma of periosteum.

Ostitismus Universalis and Hyperostosis et Myostosis Universalis Progressiva.—This is a peculiar affection of young dogs. It is indicated by numerous nodules of bone at the insertion of many muscles of the body, and great increase in the lime salts of bones and also of weight of the skeleton. It has been observed by Kitt where an animal had an enormous swelling of the head the lower jaw and the bones of the legs particularly the bones of the forearm, while the other bones of the body were entirely free from any sign of the disease. The animal suffered no inconvenience from the condition, had no fever, appetite good and general health was excellent. The deformity of the skeleton made walking irregular and difficult, and the animal moved around with a wave like motion of the body.

Multiple Periostitis.—This condition is extremely rare, there is generally more or less rheumatism and deposits in the articular ends of the bones, probably a complication of gout.

Neoformations of the Bones.—Osteophytes and exostoses, so often seen in other of the domestic animals, are extremely rare in the dog. Sarcomata (osteo sarcoma), on the other hand, appear in a variety of ways developing from the periosteum or directly from the marrow canal of bones, or in the inferior maxillary causing a tumefaction of the gum. The writer has observed two cases in the radius and ulna, which were illustrated by means of the Röntgen rays (X-rays), the destruction and alteration of the bones could be readily distinguished, numerous cases have been observed by other observers.

DISEASES OF THE ARTICULATIONS.

INFLAMMATION OF THE JOINTS.

General Pathological Anatomy of Inflammation of the Joints.—A common affection of the joints is synovitis. In a simple case of inflammation of the joints, we see an increase of blood vessels, an infiltration of the small cells, and even disintegration of the endothelial cartilage; the tissue under it becoming granular. We find quite frequently an accumulation of fibrinous or "croupal-like" membranes, followed by a cicatrization of the synovial membrane. In all acute forms of synovitis we see hemorrhages in the form of small, tick-like bodies. In inflammation of the joints, when it takes a chronic form, the synovial membrane becomes thickened, is tougher, with marked indentations on the membrane which are tree-like in form. The synovia appears in large quantities, is yellowish, clear, or slightly turbid, and dulled by cells or fibrinous flakes. If the synovia is gathered in a large quantity, we find a distention of the capsule, producing a hernia-like protrusion of those parts of the joint, where there is the least resistance. Occasionally we find the synovial membrane covered with thick clotted masses. These occur from the excessive secretion of synovia in the joints. Sometimes small bodies appear in the joints due to some parts of the hard cartilage becoming detached and in rare instances by a breaking off of small pieces of bone, and, finally, we may see the development of a cicatricial contraction of the synovial membrane; which is due to an acute or chronic inflammation of the joints, or when for any cause (for instance, dressing of fractures) a healthy joint is rendered immovable for some time. This condition may produce a temporary stiffening of the joint, but this, as a rule, is overcome in a short time.

The fibrous capsule of the joint is occasionally inflamed, but, as a rule, in acute and chronic inflammation of the joint it remains unaffected. Where there is suppuration present the capsule may become detached from the periosteum with the bone, and also may be perforated by the pus. The ligaments also become impregnated with the pus from a purulent inflammation, but, they are rarely destroyed. Occasionally, however, we may see chronic inflammation of the joints in which there is a cicatricial contraction, where the joints become firm and united, and their mobility is lost. Sometimes from traumatisms we find only the soft parts which surround the joint, such as the external ligaments or the neighboring tendons, become involved in the inflammatory process, while the inner joint seems to be very little affected.

The cartilage of the end of the joints is rarely affected by the various inflammatory conditions. In acute cases of suppuration of the joints, the cartilage may be softened, perforated, or partially destroyed, so that the bone is bare in some places. In many chronic cases of inflammation of the joints the cartilage becomes macerated and dissolved into fibres, or it may be overgrown with abnormal synovial extensions. As soon as the bone proper becomes involved in the inflammatory process, extensive granulations form, causing a peculiar spongy growth on the cartilage. These granulations crowd and perforate the bone here and there and also affect a cartilage of the opposing bone, leading to a cicatricial growth on the end of the joint. In some cases we also see the fibres and cells of the cartilage becoming soft and finally growing up with numerous raised cartilaginous cells, and presenting an acute inflammation of the ends of the joints. From these periodical conditions we may find a marked alteration in the form of the joint in which the edges of the joint protrude, and the inner surface is hollowed and grooved. A peculiarity of deforming inflammation of the joints is an inflammation of the synovial membrane, with abnormal excretion of synovia and a great enlargement of the free or loose portion of the membrane which may develop into papilla-shaped masses.

The bone, as a rule, does not become affected in acute inflammation of the joint; but if it should become uncovered from suppuration of the cartilage, the inflammation extends to the spongiosa, and we see occasionally the formation of purulent or granular centres on the surface of the bone. In rare cases the periosteum becomes covered with osteophytes.

Acute Synovial Inflammation of the Joints.

(*Synovitis Acuta Serosa.*)

The joint is swollen and hot, and the animal shows pain on pressure or movement of it. These symptoms indicate an inflammation of the synovial membrane and a lessening of the secretion of synovial fluid in the joint. It is very rare that we see intense fibrinous excretions (synovitis sero-fibrinosa), and still more rare are those cases of colorless blood-cells mixed with detached epithelia. The animals are lame when the joint is moved, especially at the beginning and toward the end of any movement of the joint. Very frequently small dogs will only walk on three feet, carrying the inflamed member.

The following causes may produce synovitis: Crushing or concussion of the joint, blows, sprains (such as falling from a height). In cases of injuries of the joints, we may expect only a simple synovitis when the injuring object is clean and the wound is cleansed immediately after the injury (removing the blood-clots and applying antiseptic dressing). According to the observations of the writer, acute synovitis occurs most frequently in the carpal joint, joints of the toes, in the knees, and hip-joints. Paint the affected joint with iodine and keep the leg at rest as much as possible. After the acute symptoms have subsided, massage the joint and allow light exercise.

There are several irritations of the joints that are observed in the work dogs of Europe that are not of interest to the English speaking reader.

The course of synovial inflammation of the joints is, as a rule, rapid. If the patient receives proper treatment, in a short time we see an improvement (especially if the animal gets complete rest). In other cases the disease takes a chronic form—that is, it may form one of the following conditions: (1) **Chronic Serous Inflammation of the Joints** (**Synovitis Chronica Serosa**). In this the joint is slightly swollen and painful, also very feverish. In some cases we may see a fluctuating swelling as a result of enlargement of the capsule by serous secretion. If the disease is still more acute, we may have a thickening of the fibrous capsules, and very frequently quite an enlargement starting from the edge of the joint. Chronic synovitis may appear in the onset of the disease, but, as a rule, it results as a consequence of the acute form. The writer has seen these cases in the carpus and knee-joint. The lameness is not especially marked, but any active movements increase it very much. (2) **Purulent Inflammation of the Joints: Suppuration of the Joints** (**Pyarthrosis**). While the two forms which have before been described are rarely accompanied by fever, it is quite different in suppuration of the joint. In this there is great fever from the onset, which is ushered in by a chill. We may see a more or less rapid swelling of the joint, which is extremely painful. The joint is kept in a bent or flexed position, and the patient walks on three feet. We may also see an œdematous swelling extending both above and below in the neighborhood of the joint. The temperature is considerably increased in some cases; the skin appears either normal or reddened, sometimes even bluish red. The pus may eventually break through the skin in the neighborhood of the joint or it may lie in the joints, become absorbed, and cause pyæmia.

This termination will occur even when the pus has broken out externally, and in some cases where the inflammation has been very acute we may have a subsequent adhesion of the joint (ankylosis).

Suppuration of the joints is frequently produced by infected wounds at or near the joint. In rare instances it may be the result of a phlegmonous inflammation in the neighborhood of the joint; concussion or crushing may also cause it, or it may occur in a metastatic way. Such inflammations of the joints may also occur as a purely suppurative inflammation; but, as a rule, the inflammations are sero-fibrinous or sero-purulent, and with it we may see purulent centres of abscesses, and followed by pyæmia; or the development of the disease in several joints at the same time, or developing one after the other at short intervals. The writer saw metastatic suppuration of the joints of the knee, carpus, and toes.

Rheumatic Inflammation of the Joints.

(*Rheumatic Arthritis.*)

Articular Rheumatism, Polyarthritis Rheumatica.

This condition is evidently a noncontagious infectious disease accompanied by more or less fever, being rare in the dog, and indicated by a sero-fibrinous synovitis of several of the articulations.

Etiology.—The actual cause of the disease has not been separated and described, some observers are inclined to think that it is not due to a specific microorganism, but that it is produced by a series of different bacteria, particularly the streptococci and staphylococci, and these produce a mild septic infection. If this theory is correct, then this disease is closely related to these inflammations of the articulations which occasionally follow infectious disease. It is caused by cold, especially in shooting dogs, if used in cold weather or during winter, when they become very wet and lie around in a draught or from cutting the hair off in cold weather and keeping animals in cold kennels.

Clinical Symptoms and Course.—There are two forms of this disease: an acute and a chronic form. The former appears suddenly, the animal becoming very lame in one or more of the articulations in which there appears a serous, but more rarely sero-purulent synovitis accompanied by great pain, high fever, loss of appetite, great depression, and constipation. The lameness is much greater than in any other form of joint-irritation, Very often several joints become diseased at one time, or the disease may go from one joint to another; if the joint is moved, or the animal disturbed it causes great pain, sometimes agony; and while any articulation in the body may he attacked, the elbow and the carpal articulations seem to be attacked most frequently, less so the ankle and hip. Occasionally we find as complications of this disease, pericarditis, pleuritis and peritonitis.

When the disease takes a chronic form, either from the onset, or merges into the chronic from the acute stage, it resembles very much chronic sero-synovitis. There is great thickening of the capsule, and sometimes the formation of adhesions between the surfaces of the joints and the connective tissue, and in rare instances we may have ankylosis of the joint. While the diagnosis is rather difficult where the disease is confined to one joint it is easily distinguished when you see it appear in several joints at once, and also from the fact that it may move from one joint to another.

Therapeutics.—The treatment is the same as in muscular rheumatism. Keep the animal warm, quiet, and wrap the affected joints in flannel, raw cotton, and frictions of spirits of camphor, oil of camphor, ichthyol, or thigneol ointments. Internal adminstrations of salol, salipyrin, salophen, plenacetin, and mild saline laxatives. When the case is chronic, joints may be painted with tincture of iodine, and when the fever lessens daily massage the joints. A careful examination of the heart should be made from time to time during the course of the disease.

Methyl salicylic.	10.0
Spirit Camphorat.	
Spirit saponat āā	45.0

M. D. S.—For external use.

Acid. salicylic.	
Adipis lanae	
Ol. terebinthin āā	5.0
Ungt. paraffini.	50.0

M. D. S.—Salicylic-Turpentine Ointment.

Aspirin	0.5——10.0

D.t dos No. VI.
S.—1 to 3 such doses daily.

Disease Producing Malformation of the Joints.

(*Arthritis Deformans.*)

The cause of this disease is very little known. It is very probably due to a chronic rheumatism, or to some inflammation of the joint. It may also be due to great exertion, and is especially seen in Holland or Canada and Alaska where animals are used to pull carts and vehicles or sleds and in coach dogs that run after carriages, and occasionally seen in pointers and setters that are constantly hunted. The first symptom of this disease is a slight lameness in the diseased joint. This lameness may be overlooked, as it is generally very slight, and after the animal has taken a little exercise it gradually disappears, although in some rare cases the lameness may continue, or even with exercise become aggravated. In the early stages of the disease there is no indication of pain on movement or pressure of the joint, but later on, pain on pressure and motion begins to show itself. At the same time there is a gradual swelling and thickening of the capsule of the joint, with apparently a loss of the normal amount of synovia. Sometimes we notice a slight heat. A peculiar symptom of this disease, which is noticed from the very onset, is a peculiar creaking or crepitating sound when the joint is moved. After a time stiffness of the joints becomes more marked. There are hard swellings on the cartilaginous borders, also a tendency of the ends of the joint to enlarge, and finally marked alteration in the form of the joint. By these changes we are enabled to distinguish between arthritis deformans and chronic serous inflammation of the joints.

The anatomical alterations have already been mentioned. Arthritis deformans, as a rule, occurs in the knee-joint, the elbow and shoulder. The prognosis of this disease is always to be unfavorable, because it seems to defy medical treatment, going on until finally the joint becomes a large unsightely mass.

Therapeutic Treatment of Inflammation of the Joints.—In all cases, except those of slight synovitis, the joint must be kept as quiet as possible. In simple cases the animal should be kept in a kennel or in a room for several days. In serious cases where no operation seems to be required, and there is no danger of poison breaking through the joints, and where the inflammatory swelling is not very great, it is best to apply the bandage of cotton and dress over that with a plaster or silicate of sodium bandage, treating it the same as a fracture. The writer has obtained very good results with this method in the carpal, tarsal, and toe-joints. Albrecht advises that the joints should be rubbed with a thick layer of citrine ointment before applying the dressing. (For further details, see under head of Dressings, etc.)

It is well, however, to take into consideration one point: that the dressing must be in such a position as not to interfere with the use of the leg. With the above treatment we generally obtain good results in a short time. In the serious forms of the disease, and where the dressing cannot be used on account of the position of the joint, we must apply such local applications as will abate the inflammation. As a rule, the best treatment is cold-water applications containing lead or arnica. In cases where there are great pain and acute rheumatic inflammation of the joint, it is better not to apply too much cold water, but use instead Priessnitz's compress. Wrap the joint in a piece of linen which has been folded several times, similar to a handkerchief, and then cover it with some impervious object, such as oil-cloth, silk, rubber, or a woolen cover. If, for some reason, neither the cold nor moist treatment is practicable, we must paint the part with tincture of iodine once or twice daily, and the fluid must be rubbed into the skin by means of a rag. The writer has never had very good results from this method of treatment, but painting with iodine produces better results than any of the liniments, such as camphor or soap liniment. Massage has been found to produce good results in many diseases of the joints in dogs, although it has not been used very extensively by canine practitioners. In chronic cases where there are great thickening and a large quantity of secretion of the capsule, as in cases of acute inflammation of the joint, or in purulent arthritis, massage with cocoanut oil is particularly adapted. In cases of rheumatic inflammation of the joint, which have been recognized as such, we must use internal remedies, such as recommended in muscular rheumatism.

In many traumatic and purulent inflammations of the joint we can only get good results by an operation which varies according to the condition. The general procedure is as follows:

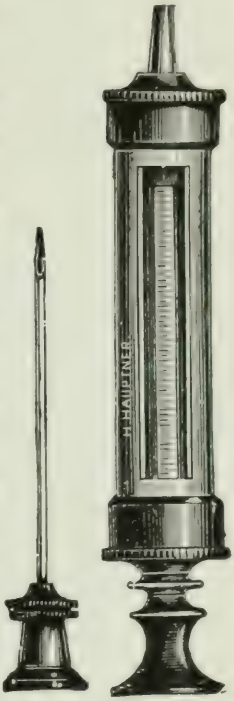


Fig. 157.—A large hypodermatic syringe for puncturing enlarged joints.

Puncturing.—This method of treatment is indicated in all chronic serous secretions of the joint. As soon as we find that the measures which encourage reabsorption, such as tight dressing and massage, do not produce good results, and where the secretion causes great distention of the capsule, and where there are great lameness and indications of suppuration, we proceed in the following manner:

(*a*) The part to be punctured must be rendered strictly aseptic; (*b*) the part must have a particularly tight dressing over it for a few days after the operation.

If this latter method is not practicable on account of the position of the joint or some other circumstance, puncturing the joint will not give favorable results and may even lead to very serious conditions (suppuration, etc.). The method of operation is very simple.

After having removed the hair from the region of the joint and washing with sublimated soap, disinfecting it with a 5-per cent. solution of carbolic acid and 2 per cent. of creolin or 1 per cent of corrosive sublimate, we then puncture the part with a good-sized hypodermatic needle and slowly evacuate the sac by drawing it into the syringe. If the syringe becomes filled and the joint is not entirely emptied, the syringe must be detached from the needle and the opening closed at once by means of the finger, as any air that may find its way into the joint will produce bad results. Empty the syringe and proceed as before.

This method, as a rule, is absolutely harmless, evacuating the sac in cases of serous secretions. If, however, we find in the fluid withdrawn from the joint many cellular elements—that is to say, if it possesses a marked purulent character—we must use at the same time an injection of antiseptic fluid directly into the joint, so as to make it aseptic. For that purpose we use a slightly warm solution of corrosive sublimate 1 to 1000 or a 2-per cent. solution of carbolic acid and a Lugol solution of iodine (1 per cent. tincture of iodine, 2 per cent. of iodide of potassium, and 50 per cent. of water). Either of these solutions may be injected through the needle into the joint; then, by manipulation, try to work this solution inside of the capsule by means of careful pressure, allowing it to flow out through the needle in one or two minutes. The needle is then withdrawn and the perforated opening is closed at once by means of an iodoform tampon, and over that an antiseptic dressing is placed. This should be allowed to remain on the wound for a few days.

(For further particulars, see the chapter on Treatment of Wounds.)

In chronic inflammations or great secretions we may also use simple injections of disinfecting solutions, such as iodide of potassium, as a means of reducing the inflammation or destroying its products. We perforate directly into the cavity of the joint by means of a hypodermatic needle and with a syringe inject a quantity of fluid in proportion to the size of the joint. This operation has to be repeated every three or four days, following the same procedure before and after the operation as has been already described.

The joint may be opened by means of a puncture with a lancet. This is advisable where there is extensive suppuration going on in the joint and where the diseased part shows every indication of a septic condition. The joint to be opened should be punctured by means of a lancet or bistoury, making a wound just sufficient to empty it freely. It must then be cleansed with an antiseptic solution and any clots or detached portions of tissue washed out; then close the wound by means of sutures. In some cases it is well to leave one corner open for drainage, that, of course, being the lower one. We then place an antiseptic dressing over the whole part.

Injuries of the Joints.

These may be divided into several groups—true wounds of the joints, contusions, distortions, and luxations.

Wounds of the Joints.—Wounds of the joints—that is to say, injuries which expose the joint proper to the atmosphere—are divided into perforating or cutting wounds, being produced by laceration, contusion, and shot.

Clinical Symptoms and Course.—The first symptom of injury to the joint, as a rule, is a discharge of synovia from the wound. This, however, may be absent in cases where the wound is very fine, or where the puncture runs in an oblique direction; the amount of discharged synovia, as a rule, is very slight at the beginning, and of normal consistency. If the wound is not closed immediately, it increases in amount and becomes thinner. In some cases it is difficult to tell positively whether the synovia comes from the joint or from the sheath of a tendon. In the latter case, however, the amount of synovia is generally very slight. Blood may accumulate in the cavity of the joint and develop a hæmarthrosis. In some cases where there is hemorrhage, the wound may be very small and close up quickly, or it may lie in an oblique direction and prevent the escape of blood. This flows into the joint and fills it up. Hæmarthrosis is distinguished from serous or purulent secretions by appearing shortly after the injury, and the absence of all inflammatory symptoms—that is, at the onset of the disease.

The other symptoms of wounds of the joints are acute sensitiveness, the animal limping and showing great pain, holding its leg in a flexed condition. Generally the external opening of the wound can also be distinguished.

The course of this disease differs greatly according to the character of the wound and whether the object that caused it was clean or not. Small perforating wounds heal quickly, and the animals limp only for a few days. In serious wounds where the joint has been exposed, and dirt or other foreign bodies have obtained entrance into the joint, the prognosis is less favorable. In such cases we notice a great discharge of synovia. This is clear in the early stage of the disease, but soon becomes turbid by the addition of pus-corpuscles and fibrinous clots. It then becomes flaky and finally purulent. At the same time there is great fever around the joint, which is swollen very much, and the neighboring tissues become œdematous, extending in all directions. We may see numerous abscesses forming all around the joint or in the intermuscular connective tissue, and finally the animal dies from general exhaustion or pyæmia.

According to the circumstances and condition of the wound, the course may be much more rapid. The synovia becomes purulent in a short time; septic fever shows itself quickly; there is a rapid pulse; the animal sinks into a coma, and dies from septicæmia. This may even occur in slight wounds, if they have not been treated properly, and where thorough disinfection has not been followed.

Therapeutic Treatment.—The first thing to do after an injury has occured is to thoroughly disinfect the wound and its immediate neighborhood. Clip the hair from all around the part, then wash it with a solution of corrosive sublimate, and, in cases where the puncture is very narrow, clean it out by means of a syringe with a 2 per cent. solution of creolin and a 5 per cent. solution of carbolic acid, or a 1 per cent. solution of corrosive sublimate. If you find the object which caused the puncture was very dirty, the wound must be enlarged and thoroughly washed with any of the above-named solutions. The wound should then be closed by means of sutures, taking care when stitching it up not to include the synovial membrane or any part of the joint in the sutures. It is well, however, in some cases, to place a small piece of catgut or silk in the lower surface of the wound in order to assist in emptying the joint. We then place the joint in an antiseptic dressing and cover it up.

If we have to deal with a wound that has been neglected and where suppuration has been going on for some time, and the owner does not wish to destroy the animal, we must enlarge the wound at once, and all pockets, or sacs, in the joint must be emptied and washed with a solution of corrosive sublimate. Any clots, masses, or pieces of tissue must be removed, and the operation finished as before described. In all these cases the animal must have absolute rest, and the dressing be renewed frequently.

Contusions of the Joints.—Under this head we class injuries to the joints which have been caused by compression of the soft parts against the bones or from shocks, such as jumping or leaping from a height, kicks, and where the extremities have been run over by vehicles. In this we may have a series of results, such as crushing or laceration of the capsule of the joint, with formation of hæmarthrosis, or a concussion or crushing of the bone with little escape of blood. In rare instances we may see a laceration of the cartilage.

Clinical Symptoms.—The animal shows great sensitiveness and pain on manipulation of the joint, and, as a rule, carries it in the air. There is a rapid swelling of the joint and œdema of the surrounding parts, also a high temperature.

Therapeutic Treatment.—The treatment consists in cold-water applications, if the position of the joint admits, renewed constantly. The best method is to soak a piece of absorbent cotton in water, lay it on the joint and bandage it up lightly, moistening it in cold water from time to time. In old cases use friction (massage) of the joint in a circular direction (twice daily for ten or fifteen minutes), or use a tight bandage. Any stimulating liniments, such as camphor, soap, or arnica, may be used, but it is questionable whether the good effects are not due more to the massage than to the drugs themselves.

Distortions of the Joint (Sprains).—By this is meant a twisting or temporary displacement of the joint, as a rule, in a lateral direction, caused by slipping or sliding, or falling out of a window and landing on the feet, tumbling over the side of a chair, bed or step. The capsule and the ligaments may be partially torn and in some cases entirely ruptured on one side. The round ligament of the hip-joint is sometimes torn, as are also the tendons of the knee-joint; there is extravasation of blood in the injured region. With rest, the disease may disappear in a few days, or it may remain, causing partial loss of power of the legs for the rest of the animal's life.

Clinical Symptoms.—When the sprain occurs there is violent pain. The animals use the joint irregularly, or may carry the member. The lameness increases, and in the region of the joint swelling soon appears. Any manipulation of the joint produces great pain, and we may be able to recognize a laceration of some of the ligaments, and the joint shows greater mobility on one side than the other. Where there is tearing of the broad ligaments of the hip-joint there is nothing indicated beyond the lameness and symptoms of pain when the joint is turned or twisted.

Therapeutics.—The treatment of distortions, or sprains, is the same as that for contusions—compresses of cold water, lead water, lead water and laudanum, fuller's earth or antiphlogistine and wrap up the joint in warm flannel. If the swelling is great, paint it with tincture of iodine, and when the swelling subsides, use massaging and rubbing with spirits of camphor or soap liniment, alcohol, etc., but it must be borne in mind that rest is the most important treatment.

Luxations of the Joint (Dislocations).—While distortions of the joints disappear in a short time when the luxation is reduced, if it is not reduced it is lasting, for soon some anatomical change occurs that it is impossible to reduce. If both surfaces of the joint are no longer in contact, it is called an entire dislocation. If they are partially in contact, it is called an incomplete luxation (subluxation).

The causes of dislocation are, as a rule, mechanical, from falling out of windows, jumping from high objects, getting the foot caught, and hanging, as in jumping over a fence; concussions and blows by being run over by vehicles, etc. In all dislocations there is invariably laceration of the capsular ligament. This membrane only remains intact in dislocations of the lower jaw. As a rule, the accessory ligaments are seldom torn except in such cases where a portion of the bone is torn with them. The cartilage of the joint may be torn or detached in some cases by the subsequent inflammation. The ends of the bones may be unaffected and in some cases broken. Other alterations are seen in the muscles and tendons in the neighborhood of the joint. They are abnormally extended on one side and flabby on the other side. They may be torn, lacerated, or even crushed. It is only in rare instances that the large blood vessels and nerves are lacerated. The joints which are dislocated are surrounded by a large quantity of blood which infiltrates the tissues and is gradually reabsorbed.

When the reduction is not performed quickly—that is to say, the displaced end of the joint remains in its abnormal position—we have what is called nearthrosis as a consequence of the irritation which it produces in the immediate neighborhood of the joint. In such a case there is slight immobility due to partial adhesions of the affected part, and also due to a certain extent to atrophy of the muscles surrounding it. In some cases motion of the joint is entirely lost.

Clinical Symptoms and Prognosis.—When a dislocation has just occurred, and when it has been there for some time, the symptoms are more marked than they are in the intermediate stage, for the reason that the hemorrhage produces so much swelling as to render obscure, to a certain extent, the position and character of the luxation. In some cases the condition can be very easily recognized by comparing it with the perfect joint on the other side; at other times, it is only by careful manipulation in the region of the joint that the alteration can be felt. We may find a projection of bone at one place and depression in another, where they do not occur in the healthy side. We may even feel the luxated end of the joint. In some cases where the deformity has been concealed by the rapid swelling of the surrounding tissues, the leg may be shorter, or it may be on a longitudinal axis with the other leg. Another characteristic symptom is the loss of movement in the luxated joint, especially when the case is seen early, although in some cases where the ligaments have been lacerated or torn, or where a piece of bone has been broken off, there is abnormal flexion in that part. This is especially important, as it enables us to locate a fracture of the bone that is in the neighborhood of the joint. There is also a slight crepitation. This, however, is soft, and not the hard, rough crepitation that we find in fractures.

Luxations are not dangerous to life except those of the vertebræ, but they are very troublesome, and, as a rule, make slow recoveries. Dislocations can be reduced quickly where the animal is seen a short time after the injury; but in rare cases, on account of the lacerated condition of the capsule and ligament, it is rather difficult to hold the injured joint in position after it has been reduced.

Therapeutic Treatment.—The treatment consists of: 1. Reduction of the dislocation. 2. In holding the joint in position after the reduction has been made.

It is rather hard to lay down any rule to be followed in all cases, but try if possible to return the joint to the same position as before, comparing it with the joint of the opposite leg, following, as a rule, the same procedure as that followed in fractures of the bone. As soon as the reduction is made the joint must be dressed and allowed to remain if possible for a period of three weeks (further particulars will be found in the chapter relating to fractures of the bones and wounds), so that the soft parts which are lacerated—the capsule and the ligaments—may have an opportunity to grow together and return the joint to its normal position. If the dressing cannot be applied in cases of dislocation of the hip, the animal must be kept in a cage or in a small room, in order to keep it as quiet as possible. We may find more or less stiffness of the joint when the dressing is removed. This can be assisted to a certain extent by means of massage.

The following dislocations appear more frequently in the dog and require special mention:

Dislocation of the Lower Jaw.—This is extremely rare, and may occur in some instances where a setter or retriever endeavors to carry a very large bird, opens his mouth, and distends it in such a way that it is dislocated. In some cases this luxation is confined to one side, and in others both articulations are out of joint. The lower jaw projects forward, the incisors project beyond the upper incisors, giving the animal an "undershot" appearance, while in a lateral direction the jaw is pushed to one side, the mouth remains wide open, and cannot be closed except with great exertion. In many cases, on account of the pressure which is caused by the coronoid process pressing on the posterior portion of the eye, it is bulged, causing what might be termed an incomplete prolapsus of that organ. Other symptoms are salivation, great pain, restlessness, blue coloration of the tongue. (For differential diagnosis of paralysis of the lower jaw, see Diseases of the Mouth.)

Therapeutic Treatment.—According to Stockfleth, the animal must be held by an assistant. The best method is to hold him between the legs and steady his head while the operator by means of a lever-like action upon the lower jaw endeavors to reduce the dislocation. To accomplish this, wrap a cloth around the hand, place the thumbs on both teeth of the lower jaw, and by means of external pressure attempt to reduce the bone into its normal condition. Another method which the author finds is not so reliable, consists in placing a strong stick between the jaws, as far back as possible, then by pressure on the anterior portion of the jaws, allowing the stick to act as a fulcrum, the jaw will very often fly into position. In order to prevent a recurrence of this, the dog for some time should wear a particularly (Fig. 158) tight-fitting muzzle and should receive nothing but soft food.

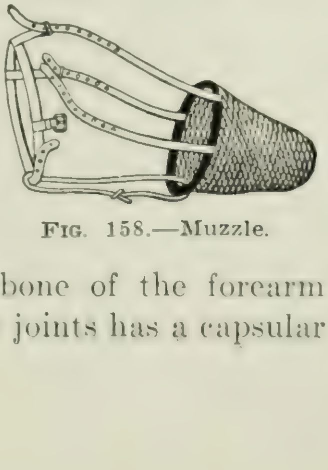


FIG. 158.—Muzzle.

Dislocation of the Elbow.—In the dog the bone of the forearm forms a pivot joint with the elbow. Each of these joints has a capsular ligament. The upper is fitted with a ring-like band, and in the lower portion the radius is kept in position by means of transverse ligaments. A slight rotation of the radius may occur independent of the elbow-joint itself. A dislocation of this articulation may occur from jumping from tables, chairs, falling from some height. In the former case the bone of the forearm is dislocated backward and outward. In dislocation of the lower pivot joint the bone of the forearm way project forward as well as backward. If dislocation of the upper joint occurs in the dog, the forearm is kept flexed; it becomes immobile in the elbow-joint, the animal using three legs and carrying one in the air. The joint is wider, and the dislocated portion of the forearm may be felt distinctly, also more or less marked sensitiveness or swelling may be seen. If, on the other hand, we have a certain amount of movement on extension of the elbow-joint and great elasticity in the joint, too much for the normal condition, the animal evinces great pain on movement. This dislocation is easily corrected. The joint may be moved freely, but as soon as the animal stands upon its feet again the displacement occurs. This is due to the annular ligament, which holds the joint to the forearm in place, being torn. If this dislocation is not reduced and left for some time, the leg will be held constantly in a flexed position, and the animal will not use it.

In cases of lower dislocation of the joint the animal walks upon three legs, and on examination we find that the lower end of the bone of the forearm is displaced in a posterior direction, and more rarely in an anterior direction. This dislocation is easily reduced, but on the slightest movement reappears again. The prognosis is not favorable, as it is a rather difficult condition to treat. The weak ligaments (the annular ligament and transverse ligaments) do not heal quickly, and the dislocation has a tendency to become chronic, especially in the upper joint.

Treatment.—In the treatment of the upper joint the forearm becomes extended and the legs should be crossed and an attempt be made to push the forearm backward and outward into its normal position. It must then be held there by means of a tight bandage. This bandage must be changed once a day, as it is apt to produce tenderness of the skin from being so tight. If the dislocation affects the lower joint, the bone of the forearm will have to be pushed into its normal condition with more or less force and a silicate of sodium bandage applied.

Dislocation of the Patella.—This is only seen in small dogs. Stockfleth states that the patella may become dislocated on both sides, but not upward, and that the dislocation is generally on the inner side, on account of the forced extension of a very much flexed tarsus and a tendency of the muscles to turn inward. This is seen occasionally in circus dogs (grayhounds) making high jumps. In cases of inside dislocation the patella lies on the inner side of the joint where it moves on the tibia, and in external dislocation it lies on the outside of the external condyle.

Inner Dislocation of the Patella.—In the early stages, shortly after the dislocation occurs, the animal holds its leg in a very flexed position. The hock is flexed and the heel turned outward. At the joint the patella may be found lying sideways, and is easily moved laterally. If we take hold of the foot and flex or extend it, the animal evinces great pain. The leg must be bent backward and straightened as much as possible, then by means of manipulation of the fingers the patella can be made to slip into position. This is very easily performed, and the animal walks away as if nothing had occurred. This dislocation, however, may recur when the animal jumps any distance. When the disease becomes chronic and dislocation occurs often, the animal runs on three legs, or walks lame on the affected leg. The stifle-joint is uneven, thick, and the patella can be dislocated, or put into position simply by pressure of the fingers. If the dislocation affects both legs, these are kept in a flexed position, the animal making peculiar jumping movements, using both legs at the same time, when he attempts to walk. If he lies down, the hind legs are extended backward and crossed. The prognosis is favorable in new cases, but unfavorable in old ones.

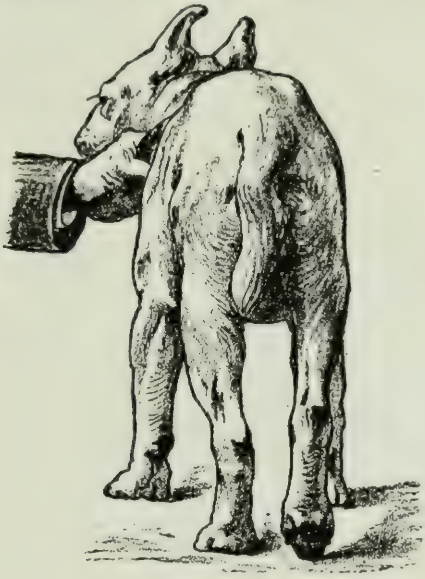


FIG. 159.—Dog with dislocation of the hip.

Treatment.—The tarsus must be extended in order to overcome the tension in the straight ligaments and extensors, and the patella may be easily shoved into position. If the animal is then kept quiet for several days, as a rule, no after-treatment is required. If the dislocation of the patella is old, treatment is useless.

Stockfleth has used a dressing in this disease which he describes as follows:

He attached a broad linen bandage around the tibia, and fastened a wide girth around the abdomen, and a breast-piece to prevent it from slipping backward. The bandage was then fastened to the tibia, close to the girth around the abdomen. The affected leg was then pulled up close to the abdomen, so that the animal must stand on three legs. The dressing remained on for twenty days, and when it was removed the animal was entirely cured. In another case he had a double-sided dislocation of the knee. After returning the patellæ to their position, the knee- and ankle-joint were covered with thick wadding, and a capsule of gutta-percha, which had previously been soaked in hot water, was applied to each leg, surrounding the leg from the knee to the toes. In order to prevent bending of the gutta-percha, before it was sufficiently hardened, a wooden support was fastened to the outside. The dog, which had formerly crept upon its hind legs, walked upright as if on stilts. The dressing was left on the animal for two weeks, and on removal of the dressing the dislocation did not recur.

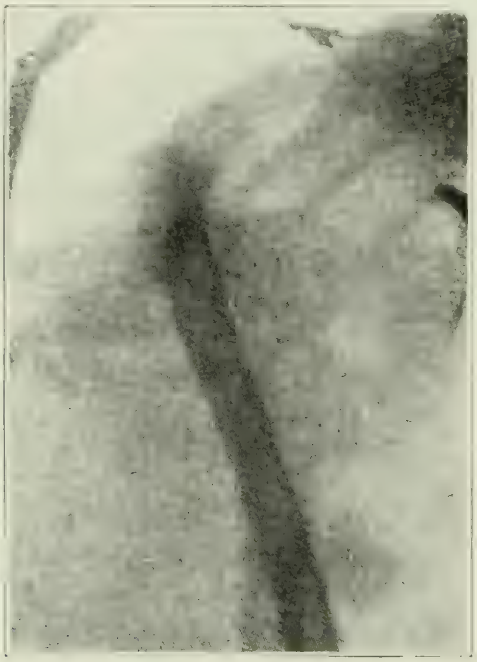


FIG. 160.—Skiagraph of luxation of the hip upwards and backwards.

External Dislocation of the Patella.—This accident is very rare. Stockfleth saw but one chronic case in both legs in a small dog. The subject was lively, walked rapidly, but had very flexed ankle-joints, giving him very much the appearance of a weasel. The tarsus appeared thick and uneven; the patella, which was located in the muscles of the outside, could easily be pushed back into its normal position; but if left, it immediately slipped out of position, and became dislocated again. This was due to the fact that the crest of the joint had disappeared, offering no resistance to dislocation. Treatment is useless, as the tissues are relaxed and will not hold the patella in place.

Dislocation of the Hip.—Other luxations occur in the dog—for instance, in the hip-joint. In this the head of the femur becomes pushed upward after laceration of the capsular ligament, and out of the acetabulum, and being drawn upward and by the muscular contraction the leg is shortened (Fig. 159).

The animal must be held by the assistant, keeping the body firm, then grasping the leg at the tarsus and drawing it along from the body downward and outward as far as possible, and keep moving the leg forward and backward; at the same time, with the other hand, seize the trochanter major in the finger, or use the flat of the hand, to manipulate the joint into position. It is impossible to keep a bandage on this part unless it is a pitch plaster, which should be applied and the animal kept as quiet as possible.

The joints of the phalanges sometimes become dislocated. These do not possess any special symptoms that may not be easily recognized by the indications stated under Clinical Symptoms of Luxations.

DISEASES OF THE MUSCLES.

Muscular Rheumatism.

(Muscular Pains, Rheumatismus Musculorum.)

Muscular rheumatism is a primary affection with more or less complication of the muscular system. In some cases there is little or no inflammation present, no fever, and the only indication of rheumatism being present is stiffness of gait and pain on pressure; it may occur as acute, subacute, and chronic.

Etiology.—The cause of rheumatism, which has been described as a certain poisonous substance, may also be due to cold, atmospheric influences, etc., or dampness, animals lying in kennels that do not get the sun, or being kept in the cellar, particularly with asphalt floors hunting dogs becoming wet, and after great exertion, sleeping with wet coats. We have, undoubtedly, a number of diseases of the muscular system which do not develop from rheumatism—for instance, abnormal muscular exertion and consequent laceration of some of the muscular fibres—also from disturbances of the circulation, from chronic toxic influences, etc., from some infectious agent as in acute articular rheumatism, certain affections of the spinal cord, also pleuritis, nephritis and other affections. It would be much better to discard the name "muscular rheumatism" and simply call it "muscular pain." Experience has taught the writer that muscular rheumatism is seen frequently in old, delicate, or fat dogs, and is oftener observed in winter than in summer.

Pathological Anatomy.—It is very difficult to make any definite statement as to the cause of rheumatism. We speak of rheumatic muscular inflammation, but at the same time we do not, as a rule, find any different muscular alterations on post-mortem from animals which have suffered from muscular rheumatism. We may find slight alterations which have occurred from other causes, such as hyperæmia, slight exudations in the muscles, tendons, and fascia. Deposits occur in the connective tissue (rheumatic callosities). These occur in a man who has suffered for a long time from muscular rheumatism, and in old rheumatic dogs we may also observe characteristic alterations in acute or chronic inflammations and the connective tissue between the muscular fibres has increased.

Clinical Symptoms and Course.—Muscular pain is a most marked symptom. This is observed in slight cases by the muscles in an affected animal having a contracted appearance, or when by pressure upon them they are found hard and tense. We also observe that dogs affected with this disease move with fear, showing great disinclination for any movement, and occasionally they cry out with pain when touched or lifted in certain parts of the body or if any portion of a particular muscle is touched. If compelled to rise, they do so in a slow, fatigued way. Their movements are stiff and strained, and when fæces are passed the animals do so with pain, frequently crying or howling, or it may be they make no effort to evacuate the bowels, which results in obstinate constipation.

As rheumatism is generally located in the regions of joints, these symptoms become modified in certain parts of the body and intensified in others. We very often see rheumatism of the back and loins, when rising and stretching of the extremities and all movements of the trunk are very painful. The region of the back and loins is very sensitive, so that the animals cry at the slightest movement. The muscles in the neck are also subject to this disease (myalgia cerviculis, torticollis rheumatica). Animals show great pain while eating on account of being compelled to bend their neck in stooping down to reach their food. The muscles are distended and painful to the touch. If the head is bent, the animal shows great pain. In rare cases we see rheumatism in the masseters (a great difficulty in mastication). Only in very rare cases is any fever noticed.

The course of the disease is sometimes acute and occasionally chronic. In the former case the disease runs its course very quickly, and may disappear without any special treatment, but there is always a tendency to relapse. In the latter form the disease may be prolonged for months, varying in degrees of intensity, also showing a tendency for the pain to move from one part of the body to another, this peculiarity enables one to readily distinguish the condition from one of traumatic origin.

Therapeutics.—When the disease is limited to a certain group of muscles, it is only necessary to keep the animal in a warm dry kennel, and feed with easily digested food and rub the affected parts with stimulating ointments such as oil of camphor, aconite and soap liniment. In rare instances the animal requires to be muzzled to prevent it from biting the affected part. Where the pains are violent, morphine should be administered hypodermically. As far as the use of electricity is concerned, the opinions concerning it are much divided. The writer has never been able to obtain any very marked results by using this form of treatment. Vibratory massage, however, seems to produce very good results in the milder and chronic cases. Internally the agents recommended for the dog are salicylic acid, salol or salipyrin, aspirin, tincture of colchicum, or antipyrin. The first three drugs produce the most favorable results.

In the chronic form of the disease, various cutaneous stimulants have been used, such as spirit of camphor, opodeldoc, spirit of mustard, but we must remember that their influence is more due to the massage than to anything else. It is advisable to rub the stimulating embrocation into the skin, either by the hand or with a woolen rag. Albrecht has found that this therapeutic treatment may be greatly improved by putting the patient into a bath of 28°, rubbing it dry and wrapping it in hot blankets.

In **General Rheumatism** internal medication is of importance. This should be according to principles given on page 473. Salicylic acid preparations are perhaps of greatest value, although not infrequently good results are obtained by the use of antipyrin, lactophenin, antifebrin and other febrifuges. Colchicum often gives good results.

Natr. salicylic.	6.0
Aq. Destillat. ad	100.0

M. D. S.—Teaspoon to tablespoonful morning and evening or three times a day.

Pyrazolon. phenyldimethyl.	5.0
Sirup. simpl.	25.0
Aqua. destillat.	50.0

M. D. S.—Teaspoon to tablespoonful morning and evening or oftener.

Tinc. Colchici.	10.0

D. S.—5 to 20 drops, well diluted with water, several times a day.

Cysticercus and Trichina.

Cysticercus.—Reference has already been made to the presence of cysticercus in the brain and they also appear in numerous other organs, particularly the muscles, and there is special interest in the fact that their presence in large numbers in the muscles may cause symptoms very similar to those of muscular rheumatism. One dog which was very stiff during life and kept the head bent to one side after death, in a section of the psoas muscle about an inch square there were found eight or ten cysticerci the size of a pea. Trasbot found in a dog that during life showed violent pain on touching the skin, pressing the muscles and on making certain movements of the body, after death numerous cysticerci of the Tænia solium in the entire muscular system. (For further details concerning cysticercus, see Internal Parasites).

Trichina.—Trichinosis is not altogether rare in the dog. In some sections it is even more common in the dog than in swine. It is observed more in some countries than in others. Of 858 dogs examined in one clinic, 11 or 1/4 per cent. were found infected with trichina. In 2910 post-mortems one-half of 1 per cent. were found affected with trichina. The symptoms which appear after a dog has eaten meat containing trichina in large numbers are for two weeks a bloody diarrhœa, loss of appetite, pain, convulsions, and after the animal was destroyed on microscopical examination of the muscles they were found to contain numerous migrating trichina. Leistikow fed three dogs with trichinous meat which afterward developed diarrhœa, great exhaustion and then became normal; they were killed six weeks later and the flesh was found to contain incapsulated trichina. Paroncito obtained similar results from feeding dogs with meat containing trichina, and two were killed after a few days and the others died in four weeks. In all cases trichina was found in the muscles.

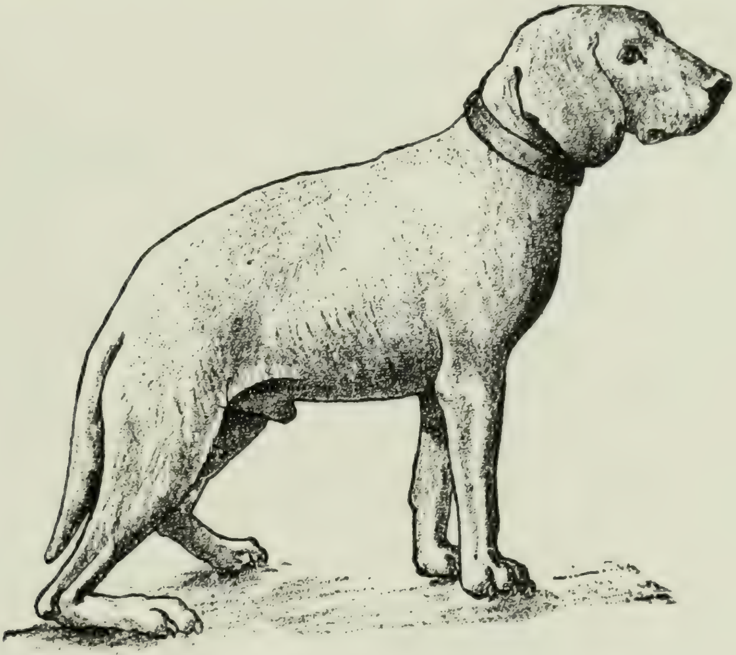


FIG. 161.—Laceration of the tendo achillis.

Diseases of the Tendons and Bursa Mucosa.

Of the pathological processes of the tendons and bursa mucosa, we will only take up the laceration of the achilles tendon and hygroma.

Laceration of the Achilles Tendon.—This condition is occasionally met with as a result of violent exercise or injuries caused by falling out of a window, or having the tendon cut either by jumping on glass, particularly on green-house sash, scythes, reaper knives, or maliciously cut by some person, etc. Occasionally it results from the bites of other dogs, causing wounds which are followed by necrosis of the tendon. On the tendon being completely severed, the ends are drawn violently apart and the animal cannot step or put any weight on the other leg without putting the posterior surface of the astragalus as well as the whole of the metatarsus flat on the ground (Fig. 161). On local examination we may find either an open wound or the skin intact, but there is a complete separation in the continuity of the tendon. The appearance of the animal is very similar to congenital plantigrade or in cases of general rickets. The articulation of the knee is excessively extended.

Boyer saw in a mastiff a complete severance of the tendon just at its union with the gastrocnemius muscle. The ends of the ruptured tendon were drawn apart about 5 cm. In incomplete laceration we find more or less exaggeration of the astragulas and bending of the knee.

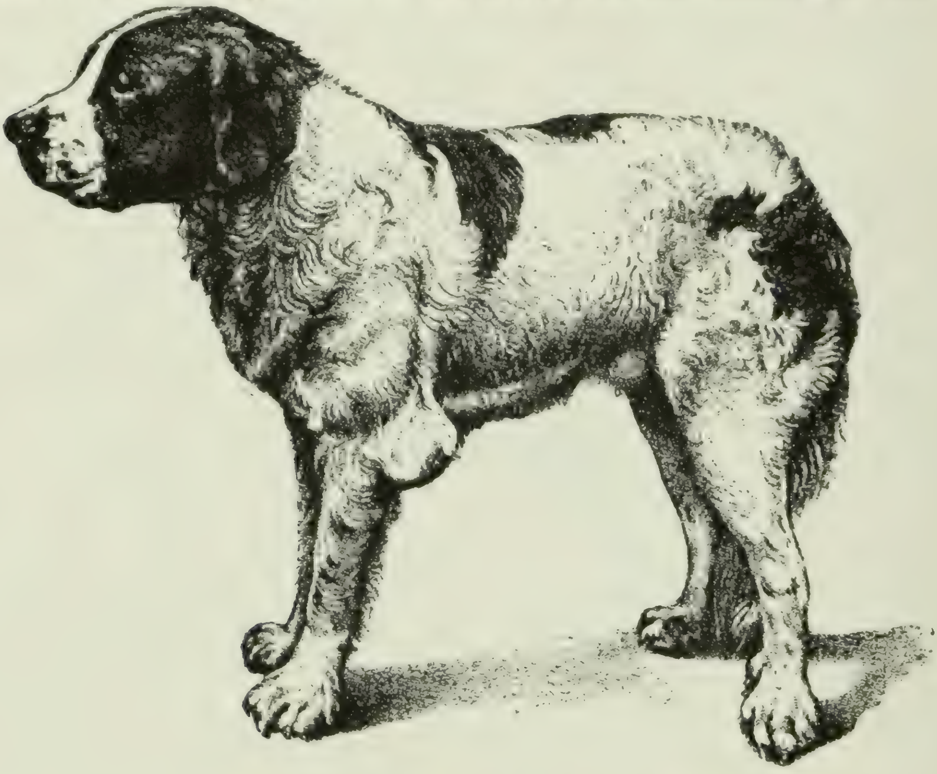


FIG. 162.—Dog with elbow boil (hygroma).

The prognosis is generally favorable. In case of a wound with severance of the tendon, the wound should be thoroughly disinfected, the two ends should be sewed together by means of catgut or silk, and the joint should be covered by a splint, plaster or silicate of soda, so as to hold it immovable. Where there is no injury to the skin, but a rupture of the tendon, a splint should be put on and the leg held in the normal position for at least two weeks. If this is not successful the skin should be opened over the lacerated tendon, the ends freshened by scarification and united by a stitch. This is generally successful.

Hygroma of the Elbow.—Large heavy dogs, particularly mastiffs, St. Bernards and Great Danes, have a habit, when recumbent, of lying on the point of the elbow, causing pressure and a gradual thickening and swelling of the skin and frequently serofibrinous inflammation of the bursa olecrani. This is shown in a round oval protuberance at the elbow, varying in size from a hazel nut to a goose egg. It is generally hot, painful and frequently fluctuating and contains a quantity of serous sometimes serofibrinous fluid (Fig. 162). As it is a great eye-sore, affecting the appearance of the animal and at the same time interfering more or less with the animal when in a recumbent position it generally is emptied by making an incision in a dependant part of the serous sac, and heals very rapidly with local treatment. It is very apt, however, either to fill up again as soon as the opening closes, or to leave more or less thickening of the skin or a hard fibrinous mass. If, however, it fills up again it should be injected with dilute tincture of iodine, or Lugol's solution. Sometimes it is necessary to open the tumor and to curette the inside of the sac to get it to heal properly. If the tumor still remains, it should be removed by complete extirpation of the enlargement. The operation is not particularly difficult, the only thing to contend against is that some animals by extreme flexion of the elbow are apt to burst the stitches. This may to a certain extent be guarded against by avoiding incision at the apex of the tumor and making it as far forward—laterally—-as possible and preferably on the median side. The operator must first shave off all the hair in the immediate region of the tumor, thoroughly disinfect it and make a long incision in a longitudinal direction through the skin over the body of the tumor, taking care not to penetrate into the body of the tumor. The tumor is now carefully dissected out and the inside of the wound carefully washed with an astringent solution, such as lead or zinc, and having cleaned out the blood clots, the freshly cut surface should be carefully touched with a pledget of cotton soaked in pure carbolic acid; traces of the tumor not removed with the knife are easily made harmless by careful application of the thermocauter; this application tends to lessen slow hemorrhage and frequently heals the wound very quickly. The edges of the opening are then united by sutures. In dissecting out the tumor, care must be taken not to remove the periosteum of the ulna. A bandage should be applied if possible, it is, however, very difficult to hold it in position. The animal should rest on deep straw or some other elastic material. The operation should be performed under anaesthesia.

WOUNDS.

For the detailed discussion of wounds and the general principles of wound treatment the reader or student is referred to special treatises on surgery. **Septicemia** and **pyemia** have been discussed on page 408, **tetanus** on page 437. Among other pathological processes due to wound infection, such as inflammation, suppuration, wound fever, etc., the **phlegmon** occupies a prominent place. Wounds produced by bites have a special tendency to develop phlegmons but other wounds sometimes serve as ports of infection to the same end. Phlegmons usually spread rapidly, produce purulent infiltrations, collections of ichorous fluids in the loose connective tissue spaces, gangrene of the skin and underlying tissues and occasionally death from sepsis. These conditions call for prompt and energetic treatment; incision, drainage and disinfection. **Erysipelas,** on the other hand, is a less common wound complication. It is characterized by certain general symptoms such as fever and loss of appetite (possibly also vomiting and diarrhea), and by the presence of a hot, painful more or less reddened flat swelling (light, dark or bluish red in unpigmented skin) which may spread slowly or with great rapidity and sometimes assume a migrating character. In rare cases vesicles or bullae may be present (Erysipelas vesiculosum s. bullosum) or there may be gangrene or phlegmonous processes (Erysipelas gangrenosum s. phlegmonosum). In addition to appropriate internal treatment lotions as follows (either alone or in combination with Priessnitz bandages); sugar of lead, acetate of alumina, creolin solution, ointments of camphor, ichthyol, thigenol, painting with tincture of iodin or iodin ointment, applications of alcohol or spirits of camphor. Where indicated—scarification, incision, drainage. For further details consult works on surgery.

Wounds of special character are discussed below under the headings of Ulcers or ulcerations, Contusions, Burns and Scalds, Frost Bites, Snake Bites and Wounds of the Tip of the Tail.

Ulcers or Ulcerations.—By this we understand a granulating surface which does not heal on account of the purulent destruction of the granular tissue. Wounds are changed into ulcers when they are continually irritated by some mechanical or chemical irritant, or as a consequence of the skin becoming inflamed or necrosed from pressure (muzzling, etc.). Callous ulcers and fistulous ulcers are the most difficult to treat. The former are superficial ulcers with hard, callous centre, having raised edges, and a whitish, hard, bacon-like surface. This is covered with a thin unhealthy secretion. They may form sinuses or canals, which very often contain, at the bottom of the sinus, a foreign body or necrosed tissue. They may also lead to some of the glands. These pipes are called fistulæ or fistular canals.

The treatment of ulcers is, to a certain extent, the same as that of wounds—that is, to follow all the antiseptic rules. The use of dermatol, airol, aristol, subnitrate of bismuth, salicylic acid, naphthalin, powdered camphor, or boric-acid ointment is advisable. We may also remove callous ulcers by surgical means and convert them into fresh wounds by taking a knife, paring the tissue at the bottom of the ulcers, and treat them as indicated in cases of fresh wounds. Caustic agents produce little or no good effects. If the tissue surrounding the ulcers is hard and rigid, preventing contraction of the ulcerated area and the healing process, we must perform circumcision of the part, as transplantation is not practicable in the dog. We cut about 1 cm. from the border of the ulcer over its entire thickness, keeping the wound open by means of vaselin. When we treat a fistulous canal and the location of the fistulous sinus admits of it, we split open the fistulous passage and convert it into an open wound. When the fistulous canal is not very deep we may also try to produce healthy granulations by means of actual cautery, or the injection of caustic fluids or the introduction of crayons of caustic (nitrate of silver or caustic potash). Always try to slit open the canal, if possible, as it produces the best effects. Nitrate of silver or any of the mineral acids, and in obstinate cases a small piece of corrosive sublimate, is pushed down into the bottom of the wound; these caustics produce more or less irritation and consequent sloughing of the wall of the canal and allow the growth of healthy granulations.

Contusions.—In subcutaneous wounds of the soft tissues (bruises and contusions) we find a different condition of the tissues. These injuries are generally caused by some blunt object—for instance, a blow, kick, shock, or fall. The soft parts are bruised and injured according to the intensity of traumatism; very slight resistance is offered by the loose connective tissue; small blood vessels are ruptured from crushing or bruising the soft parts, and the hemorrhage that follows percolates all through the torn tissues. The greatest amount of resistance is found in the skin, face, sinews, and large blood vessels.

Clinical Symptoms of Contusions.—One of the first symptoms of a subcutaneous bruise is a swelling in the region of the injury. This appears, as a rule, immediately after the injury, and is due to the blood running out of the torn vessels. The fluids in the enlargement always contain lymphatic substances on account of the laceration of certain lymphatic glands. In rare cases we see a lymphatic secretion only, which is distinguished from the blood secretion by being very slowly absorbed. The fluid which appears lies either in the loose connective tissue under the skin or between the muscles, and, as a rule, is irregularly divided, or we may find the condition presented in a number of ways; for instance- we may find a "doughy" swelling in one case, or it is accumulated in centres in another, or we see a fluctuating swelling or a "blood boil" (hematoma), or it may run into a cavity, and we have a bloody secretion of the joint (hemarthrosis), or we find a bloody secretion in the cavity of the chest (hematothorax). The swellings, as a rule, occur shortly after a contusion, and in the early stages rarely show any inflammatory symptoms. Later, however, inflammatory symptoms may appear.

Beside the swollen condition of the tissues, the animal may present symptoms of pain, especially at the time of the injury, and later on we find the injured region very tender to the touch.

The further course of the wound depends to a great extent on the amount of the injury. If the skin is crushed in such a manner that all the vessels are torn, it will become necrosed from deficient nutrition, and, as a result, is indicated in the discharge, which contains septic blood and broken down tissue.

In the treatment of contusions, to get good results we must have one object in mind—that is, the rapid reabsorption of the secretion. For that purpose we use cooling compresses soaked in lead-water (Goulard's extract), or arnica-water, or we may try to get absorption by means of massage—that is to say, make a centrifugal friction with the thumbs, fingers, or hand for fifteen or twenty minutes at a time. We may also squeeze the excreted blood into the tissues and lymphatic passages by means of firm manual pressure, and apply a tight bandage immediately afterward to prevent any recurrence of the subcutaneous bleeding. This latter treatment is not to be practised unless the swelling is very small and there is very little fluid in it.

The therapeutic treatment is not simple in all contusions. In large "fluid-boils" we rarely can wait for an absorption of the secretion, but are compelled to open the swelling at the point where it is soft and where the skin is thinnest. In animals we must always try to make an opening in the dependent part of the enlargement, so as to get perfect drainage. After having opened the tumor, clean it out, removing all clots, etc., and treat the inner surface of the wound according to the usual method, applied in such cases. If the location of the wound prevents such a procedure, the fluid may be emptied by means of a hypodermic syringe, and an antiseptic solution injected in its place, and, if possible, this should be followed up afterward by a compress-dressing.

In all cases where the skin is very much injured, or where extensive destruction of the soft parts has taken place, or even fracture of the bone has occurred, we cannot use massage, but instead compressing antiseptic dressings must be applied. As a rule, treat the slightest injuries of the skin according to the best antiseptic methods.

Inflammatory symptoms are observed as soon as fever appears. The skin becomes hot and painful; finally fluctuation is found in some parts. Then we must immediately remove the secretion, clean out the wound, and by drainage keep the cavity empty, at the same time inject into the wound a 1 to 1000 solution of corrosive sublimate or a 5 per cent. solution of carbolic acid, and use an antiseptic bandage.

Burns and Scalds.—In cases where a high degree of temperature acts on the skin it causes hyperæmia in milder cases, to necrosis and sloughing in severe cases. For convenience of descriptions, we divide burns into three classes or degrees. The first degree of burning is indicated by great pain, redness and swelling of the skin; the second degree causes violent serous exudation in the stratum mucosa and is indicated by the formation of blisters containing a yellowish serous fluid which dries or may burst the vesicle when it is followed by more or less suppuration. Burns of the third degree are indicated by more or less extensive necroses of the skin. The necrosed portion of flesh forms a scab which is separated from the surrounding healthy tissue by a demarcating line of granulating tissue. Extensive burns may cause death in a few hours. In such cases the animal shows violent pain, is greatly excited and restless, the pulse is very high, hard and wiry. The respirations are increased, subnormal temperature and death follows in a short time. Sometimes there is violent vomiting, followed by convulsions; the prognosis depends on the severity of the burns or scalds. Very frequently a scalded animal is disfigured for life as a result of the extensive destruction and subsequent necrosis of the epidermis, which destroys the hair bulbs and prevents future growth of hair. Treatment in all cases consists in applying cooling applications that prevent the air from reaching the burned surface, such as flour, starch, boracic acid, or talcum powder, applications of solutions of lead water, acetate of alum or cresol, or unction of petrolatum, zinc or lead oxide ointments, also ointments of ichthyol or thigenol (1 to 10), lead liniment 1 part of acetate of lead and 10 parts of olive oil, calcium liniment (so-called carron oil), lime water and linseed oil equal parts, or mixture of equal parts of carron oil and carbolized oil (1 to 20) or a mixture of a beaten up egg and linseed oil. Blisters of very large size should be opened with a fine needle, taking care to make a very small opening in the covering of the blister and endeavor to prevent it from being rubbed off. In case the epidermis—that is to say, the covering of the blister—is rubbed off, the above-mentioned salves and liniments can be used, but drying powders such as dermatol, airol, aristol, subnitrate of bismuth, oxide of zinc are much to be preferred. These drugs are generally rubbed up with starch or talcum and dusted on the sore by means of a pledget of absorbent cotton, a perforated tin dusting box or blown on by means of an insufflator. Powders of salicylic acid or magnesia in combination with talcum powder should be employed where there is suppuration or scalding of the third degree. Some recommend a solution of picric acid 1 to 100, or a 5 per cent. solution of nitrate of silver. Where the animal is in very violent pain, we should use **cocaine** 1-30 or anesthesin ointment 1 to 10 or 20 in solution as a local application. A bandage of absorbent cotton is put over the scalded portion. This is rather difficult, however, to keep in position, as in cases of severe scalding the animal constantly moves or twists the body in endeavoring to lick or bite the wounds. This must be prevented if possible. In cases of acute or extensive scalds the animal must be covered with cotton batting and given some of the various stimulants such as alcohol, camphor, or ether, **and also, the subcutaneously, physiological solution of common salt is to be recommended.**

Aq. calcis	
Ol. lini or olivar. aa	100
M. D. S.—Liniment for burns.	

Aristol	4.0
Ol. Olivar.	10.0
Vaselin.	40.0
M. D. S.—Ointment for burns.	

Frost Bites.—Freezing is comparatively rare, probably due to a certain extent to the fact that frost bites, if they happen to be mild in character, are either overlooked or mistaken for other affections. Frost bites occur in hunting dogs, in the work dogs of Europe, and also the sled dogs of Canada and Alaska. Freezing generally appears in the feet. Müller and Frick found freezing to be rather common in hunting dogs, but, except when it is more or less extensive, is not observed by the attendants of the animal. Schneidermuhl observed a bitch that had a frozen udder. Schindelka saw one case where a dog had his ear frozen. As in burning, we divide freezing into three degrees depending on the severity of the symptoms. In freezing of the first degree we find in the frozen portion slight dark red or blue colored swellings. In freezing of the second degree, there appear a number of bladders or blisters, containing yellow hemorrhagic serum, and after the vesicles burst there is more or less loss of tissue and the wound heals very slowly leaving a very pronounced cicatrix. Freezing of the third degree is accompanied by more of less gangrenous mortification of the frozen portion.

Chilblains (perniones) are seen occasionally in dogs that are kept chained in yards and pointers that hunt in the snow or over frozen ground. The treatment of frost bites of the first degree consists in attempting to remove the venous stasis by means of friction or a liniment, such as spirits of camphor or aconite or paint the affected portion with tincture of iodine. The application of moist, warm compresses is also beneficial. For freezing of the second degree, in which blisters have been formed, apply drying powders already mentioned and if gangrene has commenced, the wound must be treated with antiseptics. Where the animal is completely frozen, as is indicated by the rigidity of the body, avoid warming the animal too quickly. The animal must first be rubbed with a cloth which has been dipped in cold water or given a bath in cold water and gradually the heat of the water increased up to the bodily temperature; at the same time the body is to be rubbed constantly. Subcutaneous or intervenous injections may be administered, such as ether or camphor. Artificial respiration may also be resorted to.

Snake Bites.—In Europe there are three species of venomous snakes which may bite dogs. They are the common viper (vipera berus), the asp (vipera aspis radii) and the sand viper (vipera ammodytes). The first serpent is found all over Europe, the asp in Switzerland, the sand viper in Dalmatia. In America we find the rattlesnake (crotalus) and the copperhead (trigonocephalus contortrix) and moccasin (toxicophis piscivorus) and puff adder. The poison of the snake lies in two glands which lie at the base of the long teeth. Sporting dogs and shepherd dogs are generally bitten on the legs and sometimes on the mouth. A short time after the animal is bitten, we find about the bitten portion a bluish-red tumefaction which is extremely painful and has a doughy-like feel to the finger. The pulse is small and thready, the respirations frequent. The animal attempts to vomit and finally may become totally paralyzed. As a rule the animal makes a good recovery and it is only in rare instances that it results fatally. The treatment consists in putting a tight ligature immediately above the affected portion and this must be left on until the effects of the poison have passed off. Subcutaneous injections of spirits or ammonia diluted with three parts of water. The following drugs are also recommended to be applied directly to the wound: calcium chlorate, chloral water, tincture of iodine, hydrate of potassium or nitrate of silver. The thermocautery can also be used. It is to be understood that any of the preparations to be of any service, must be used immediately after the animal has been bitten. Karlinski recommends subcutaneous injections of solution of chromic acid (1 to 100). Lacerda advises subcutaneous injections of permanganate of potash (1 to 60). Where the animal exhibits great weakness, we should administer alcoholic stimulants—brandy, whiskey, or sherry—and to these add a few drops of spirits of ammonia. Ether, camphor, atropia are all advised as stimulants. A serum has been prepared to combat the effects of a snake bite.

Wounds of the Tip of the Tail.—Wounds or injuries to the tip of the tail are generally found in short-haired dogs with long tails, particularly great danes, pointers, and beagles. Wounds of this character are caused by the dog shaking the tail and hitting against solid objects, particularly where dogs are kept in narrow kennels and wag their tails and strike the sides of the kennel. It is a peculiar fact that while injury of the tip of the tail is insignificant, it is one of the most difficult to treat and cure. This is caused by several facts; first dirt and scabs collect on the wound which causes the animal to constantly lick and gnaw the sore. Another fact is an animal will keep gnawing at the tail when there is apparently no reason for it. The tail seems sometimes to be intensely itchy, due probably either to neuritis or to itching eruptions of the skin. The animal gnaws and bites the tail as if in a fury of pain or irritation until the vertebra is exposed causing necrosis of the bone and slough of portions of the tissue or even one or two bones of the coccyx. Sometimes we find certain eczematous eruptions that extend from the back and root of the tail along the entire body of the tail, and the animal is constantly licking and biting it.

The first line of treatment is to endeavor to lessen the irritation and to heal the sore. First clean the tail carefully and thoroughly with warm water and soap and remove all dirt, scabs, etc., from the injured or irritated portions, and after drying the tail, dust on antiseptic powders such as boracic acid, airol, dermatol, iodoform, xeroform, Bismuth, or tannoform or even paint the injured portion with collodion or compound tincture of benzoin. Where there is an ulcerated portion of the skin, it should be stimulated with a stick of nitrate of silver or in cases where there is deep ulceration it may be necessary to touch the affected portions with the thermocautery. After applying the antiseptic dusting powder it is necessary to apply a bandage on the tail and for this purpose there is nothing better than a bandage held in place with carpenter's glue. This is applied in the following way: Strips of muslin or linen are covered with glue (ordinary glue that is warmed slightly to render it more liquid) then the affected portions are covered with the antiseptic dusting powder and a small portion of absorbent cotton filled with the powder is applied. The strip of muslin covered with the glue is laid on lateral sides of the tail from the root of the tail around the tip and back and the glue-covered side directly on the hair (Fig. 163). Another strip may be put on, covering the superior and inferior surfaces of the tail, then strips are wound around the tail to hold on these strips, either at the root and tip, as shown in Fig. 163, or along the entire tail as shown in Fig. 163. Care should be taken not to wind the circular strips too tight as the bandage is apt to contract quite considerably when the glue dries. The bandage sticks closely to the hair and has many advantages over adhesive plaster. It is impossible for the animal to shake it off, and if he should show an inclination to gnaw at it a muzzle should be put on the animal. The bandage should be changed every five or six days. The bandage is removed by putting the tail in warm water or covering the bandage with a cloth saturated with warm water and allowing it to remain for ten minutes, when the strips are easily taken off; the tail washed, dressed and another bandage applied, taking the precaution to have the tail dry before re-applying the glue bandage. A leather cone for the protection of the tail, called a "tail-muzzle," generally causes great irritation and the animal is in a constant state of irritation while it is on and is constantly trying to get it off.

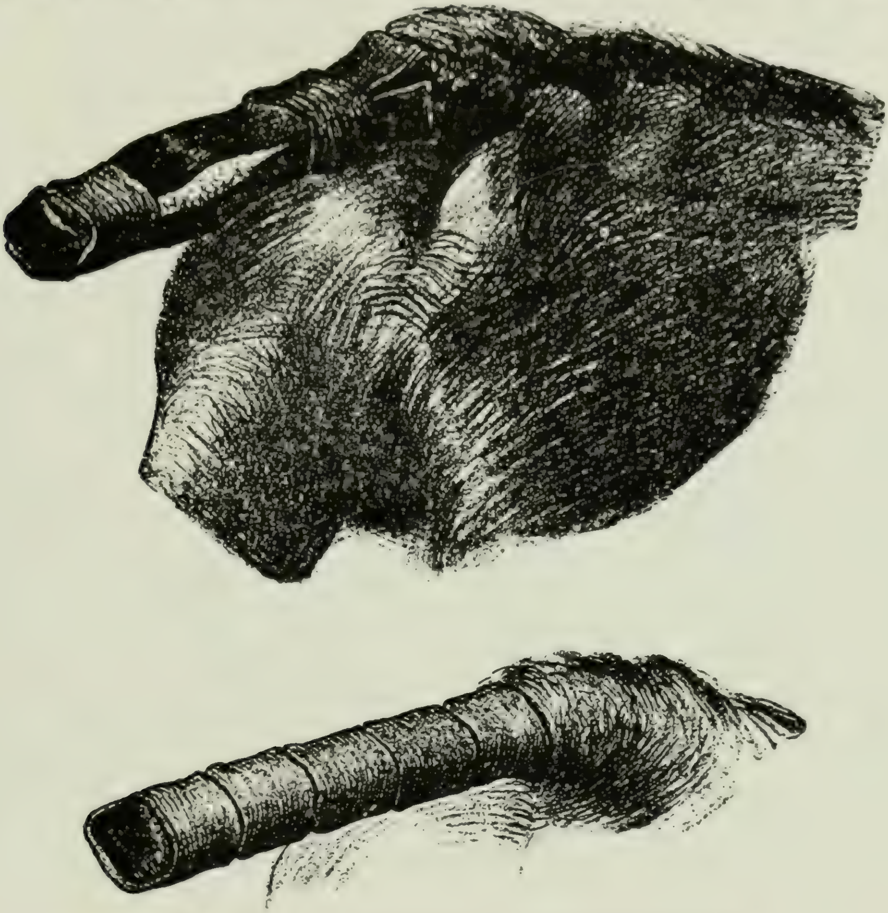


FIG. 163.—Bandage for injuries or amputation of the tail.

Amputation of the Tail.—The necessity of amputation of a portion of the tail may not only originate from the causes already enumerated but from the tail being run over by a wagon wheel, from being caught between swinging doors, or being tramped on. It may also be caused from fracture of the tail or from malformations. Occasionally it may be the seat of a diffuse swelling as a result of phlegmons or from septicæmia from the wound of the end of the tail becoming infected. In such cases, however, it is best to make a series of longitudinal incisions in the tail where the swelling is greatest and allow the serum to escape and at the same time give an energetic course of antiseptic applications and if these measures do not succeed, then we have to resort to amputation. Amputation of the tail is also performed in pointers to shorten the tail and prevent them from getting the tail sore going through brush and lacerating the end. And lastly certain breeds of dogs have their tails amputated when young as a matter of fashion.

When local applications do not have the desired effect and the tail becomes gradually worse or the vertebra becomes necrosed the only means left is to amputate the affected part.

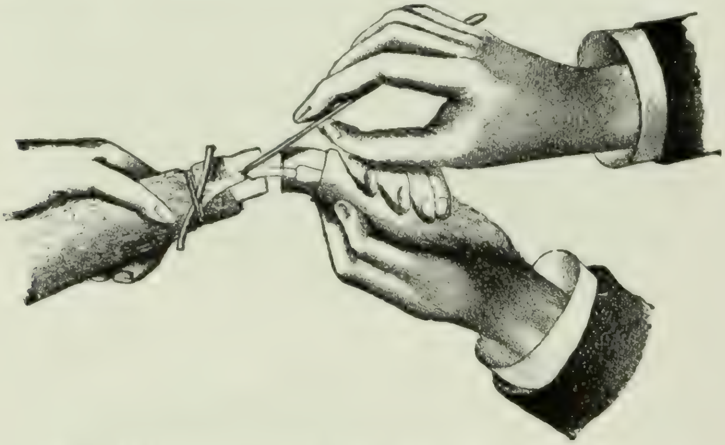


FIG. 164.—Amputation of the tail (circular operation).

The operation is a form of exarticulation. An amputation between two of the vertebræ is much better than cutting through one of the bones. The operator must distinguish the slightly enlarged portion (**Fig. 164**) where the articulation lies. Put the animal under ether or give a hypodermic injection of morphine or a subcutaneous one of cocaine; have tied an elastic band around the tail above the point of operation, then proceed by means of the flap or round operation, whichever is preferred. As the vessels bleed slightly they can easily be stopped by means of a thermo-cautery. The circular operation, cutting posterior to the bony protuberances of the articulation; pull the skin back, cutting through the muscles and tendons just below the articulation; then, with the help of an assistant, pull up the tissues and cut between the cartilaginous discs. Then bandage the tail as shown in Figs. 163 and 165. In cases in older dogs where there is much hemorrhage the artery may be taken up by means of a catgut ligature or touched with the thermo-cautery. The edges of the skin are united by interrupted suture and an antiseptic dressing is applied, taking care not to make it too tight. The flap operation is the same as has already been described.

The operation of cutting puppies' tails in fox terriers, spaniels, poodles, is best done just before the puppies are weaned When, after judging the proper length the tail is to be, in proportion to that of the body, the tail should be cut through with a sharp knife. It is not necessary at that age to attempt to cut exactly through the articulation.

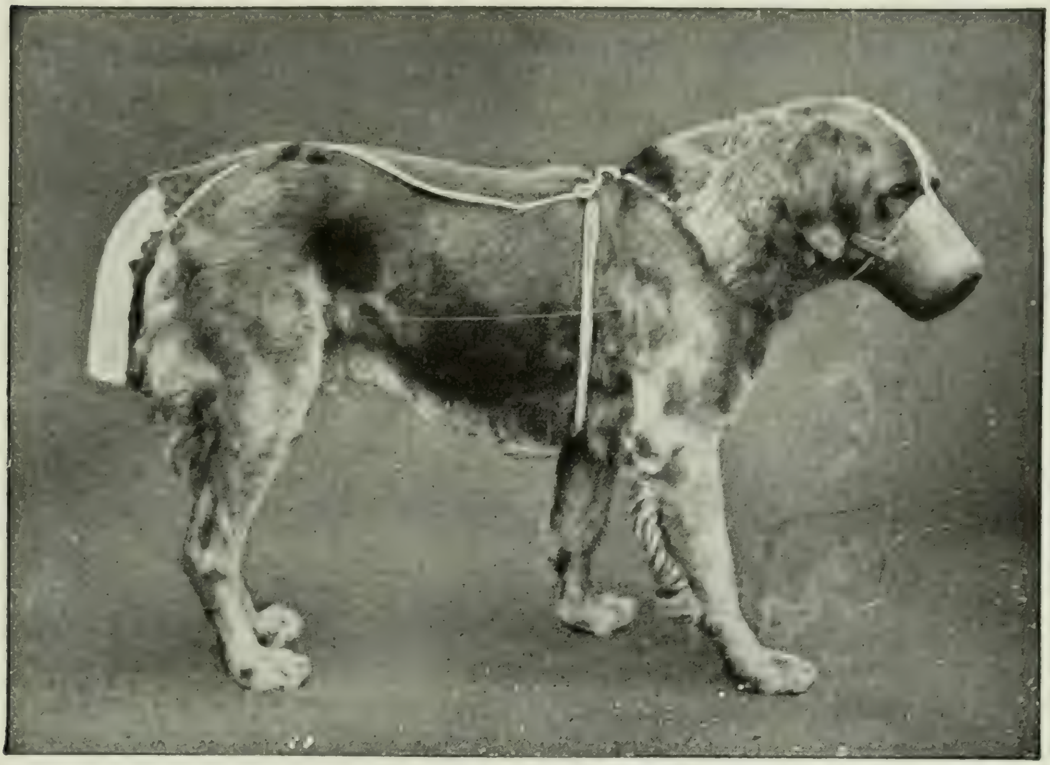


FIG. 165.—Casing of tail to protect bandage.

DISEASES OF THE CLAWS AND FOOT PADS.

The claws, the third phalanx, of the toe (the bone of the claw) articulates with the second phalanx; near the articulatory surface is an annular fold (claw fold) which receives the free border of the claw. The phalanx tertia is covered by the cutis vera. This develops and grows from the matrix of the claw plate (coronet), the claw bed, and the muscular sole which is an extension of the corium which extends over the third phalanx after dipping into the circular furrow at the base of the bone (Fig. 166). In order to protect the ends of the claws when not in use there is an elastic tendinous band which draws back the nail and when the foot is on the ground the nail is retracted (Fig. 167) and the weight of the body carried on the pads, those pillow-like elastic bodies, a large one in the centre and four radiating in front of it, corresponding to each toe, the thumb toe being too high up, does not get pressure (Fig. 168).

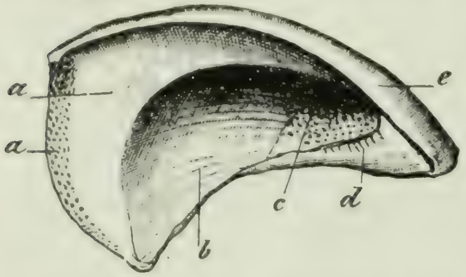


FIG. 166.—Nail. Longitudinal section of nail. *a*, Matrix of nail horn; *a'*, papillary zone of nail horn; *b*, bed of nail; *c*, matrix of cushion; *d*, cushion; *e*, nail. (*Siedamgrotzky.*)

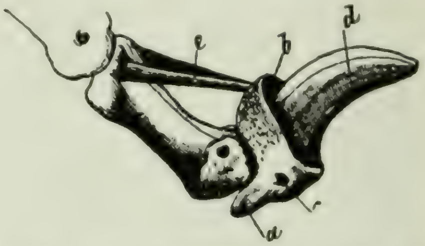


FIG. 167.—Diagram of the 2nd and 3rd phalanx. *a*, Tubercle of pad; *b*, horn groove; *c*, groove of sole; *d*, third phalanx; *e*, dorsal ligament. (*Siedamgrotzky.*)

Ingrowing Claws. Incarnatio Unguis.—Animals that are house pets and have little or no exercise do not wear the nails properly and they become long and are apt to strike the ground when walking. Occasionally these nails become so long as to turn under and the weight of the animal presses the claw into the pad and the claw is gradually buried in the flesh. The dew or spur claws on the posterior extremities frequently grow entirely round and grow into the pad, causing great irritation, swelling and suppuration. It is extremely painful, the animal constantly licking the affected part. It can be cut through by a pair of jeweler's wire clippers, care being taken not to cut it too close and involve the matrix.

Splintering, cracking and breaking of the claws are generally due to some traumatism, although occasionally the claw falls off from purulent inflammation of the matrix. The broken ends of the claws must be filed or pared down to make the surface smooth and prevent it catching in carpets, rugs, etc., and tearing it further. Occasionally a dog with long crescent-like nails, due to want of wear, catches it in a carpet or rough boards in a floor when he is running and the claw is torn loose from the matrix, hanging by a small piece of very sensitive flesh, and every time the animal moves or it touches an object, it causes extreme pain. As it is generally hanging by a small portion of flesh it can be seized by the fingers and quickly torn off, or if it is more firmly fixed, it can be cut off by means of a pair of small wire cutters, care being taken not to cut too close to the matrix.

Where there is extensive injury to the matrix, it may be necessary to exarticulate the part.

Where the nail is torn from the matrix and that is exposed, it is not advisable to bandage it for house or lap dogs. Painting it once daily with compound tincture of benzoin or tinc. aloes usually suffices.

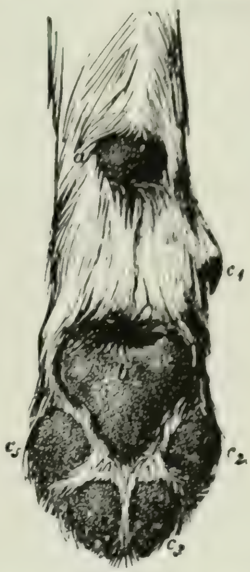


FIG. 168.—Pads of foot. *a*, Carpal pad; *b*, sole; *c*, 1 to 5, toe pads.

Inflamed Claw. Panaritium.—This may originate from traumatisms, such as being stepped on, crushed between doors, or the extension of inflammatory process from the leg, from unknown causes which develop an inflammation of the matrix of the claw, and is also seen in dogs that are very highly fed and are plethoric. There frequently appears a gouty inflammation of the second phalanx and the matrix, causing considerable congestion, pus and sloughing of the nail, seen sometimes as epizootic in character in large kennels. Eczematous eruption of the local epidermis is also common in overfed dogs; the two conditions are apt to recur in these plethoric dogs from time to time. In rare cases pus is found and may burrow under the tissues, causing fistula or after the acute inflammation subsides, a thickening of the toe. Occasionally one toe is attacked and when the acute symptoms subside, then another is

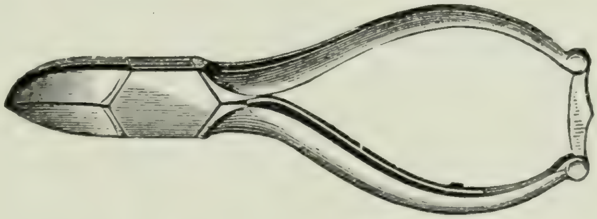


FIG. 169.—Claw scissors.

attacked; it has been thought to be contagious, but this condition is so frequently seen in overfed animals that it evidently is gouty in character. Frick found that salt water produced irritation of the claws in animals that were at seashore places during the autumn and winter. Rabe ascribes this condition to a microbe which he calls Cladothrix canis.

In acute inflammation of the claw the animal is very lame and on examination of the toe it is found hot, swollen and very tender to the touch; the skin surrounding the affected toe is tumefied and congested; the claw is very painful; the animal gives evidence of acute agony if it is touched; the claw is dull, the natural lustre having entirely disappeared, and frequently the claw may have changed its position, that is, it may curl under or turn to one side; in one case observed the claw was flattened like the nail of a man.

Treatment, Antiseptic Fomentations, Etc.—Fomentations and poultices, painting the affected toes with tincture of iodine. It generally is best to repeat this application two or three times. If the claw is purulent, it must be treated with an antiseptic dressing of corrosive sublimate, 1 to 2000 solution; when the claw is loose, it must be removed, taking care not to injure the matrix or the skin at the edge of the nail and destroy the secreting power of the claw. Frick has prevented the further extension of the disease by intraparenchymatous injections of tincture of iodine, the internal administration of Fowler's solution, and touching the affected claw with nitrate of silver. Lugol's sol., oil turpentine, iodoform, also recommended. The nail can be protected by means of the shoe illustrated in Fig. 170.

Amputation of the Toe. Removal of a toe may be necessary (or requested) in panaritium, severe injuries, bruises, complicated fractures, tumors of the bones, supernumerary toes. Precautions for making a bloodless operation and general or local anesthesia are necessary. If total extirpation is intended the skin is incised longitudinally on the dorsal surface of the toe from the first phalangeal articulation down to the annular fold of the claw, at which point, close to the claw (or nail) a circular incision is made parallel to the wall of the claw, utmost care being observed not to injure the toe pad. The overlying skin is then carefully dissected away from the phalanges and the latter, beginning with the first articulation, pulled out dorsally and ex-articulated. Amputation may also be made in the bone (first phalanx) by means of a wire saw.

The removal of supernumerary toes is a simpler matter. If the toe in question is attached merely through the medium of the skin or a thin tendon from the Os metatarsal, ligation at the base followed by incision with the knife at the proper distance from the ligature completes the operation. Bandaging is usually unnecessary. A muzzle or the application of tincture of aloes, to prevent licking is sufficient. However, when there is communication with the bone (presence of a true Os metatarsal) the skin is incised longitudinally down to the toe, a circular incision made around the latter and the metatarsal bone cut off at the upper end with forceps or wire saw. After the hemorrhage has been stopped the wound is closed with proper sutures and an occlusive bandage applied.

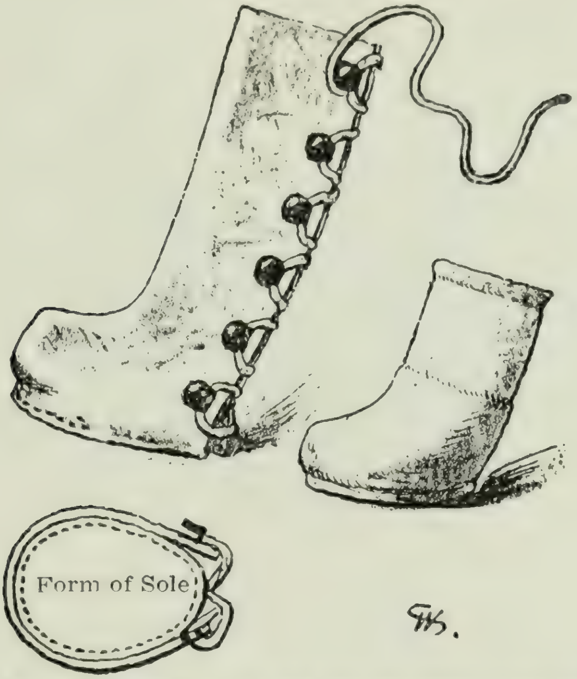


FIG. 170.—Dog's shoes: Laced leather shoe showing shape of sole, and rubber shoe.

Contusions and Wounds of Pads.—Contusions of the pads are most frequently observed in sporting dogs, particularly in animals that have not been used for active work or when they are first trained, going over stubble fields, or in dogs going over long distances on snow or frozen roads. Occasionally we find extensive œdema and sloughing caused by the presence of an elastic band placed around the foot or toes by a child in play.

The animals walk very stiff, or in some cases it may be almost impossible to get them to walk. The pads are hot and painful on pressure; if the pad is very much worn the dark external skin is worn off and the red tissue shows on the surface; in cases of extreme wear there is suppuration and sloughing of the pad. Occasionally foreign bodies, nails, glass, stones, tacks, splinters of brass wire, etc., stepping in acids, particularly when emptying electrical batteries, or stepping in fresh slacked lime. In the latter case the external portion of the pad is frequently entirely sloughed off.

Treatment.—In simple contusions rest is all that is needed; in more severe conditions, paint the pad several times daily with compound tincture of benzoin, or use compresses of sugar of lead water or acetate of alum. When the skin is separated, clean it with an antiseptic wash and remove the loose portion of tissue and cover it with tincture of benzoin and apply a compress. In the first examination of an animal in this condition it is always necessary to make a careful examination of the part to see if there are any foreign bodies buried in the pads. When the soles are very tender the shoe shown in Fig 170 is very useful. Sole protectors are also made of chamois leather.

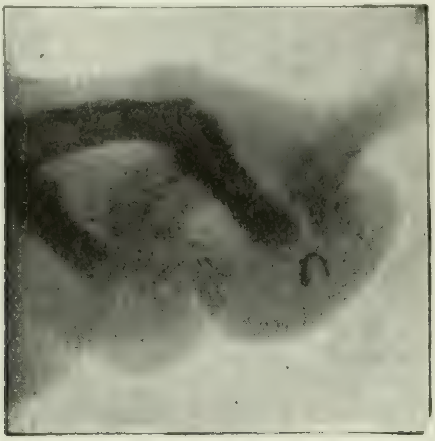


FIG. 171.—Foreign body in toe pad—X-ray.

Inflammation of the Interdigital Web.—The same causes that produce contusions and wounds of the pads may lead to inflammation of the interdigital web. This is most common in dogs with long tarsi set at abnormal angles and spreading toes (open toes, flat feet, rabbit feet). The results of running about on uneven, hard, gravelly ground, stubble fields, newly made streets, etc., are most evident in feet of this structure.

Aside from the general symptom of lameness it is only in the mildest forms of inflammation of the web that mere erythema constitutes the chief pathological change. As a rule these inflammations take on the character of eczema or acne and should be treated accordingly. In addition to proper general care and good nursing the best results are obtained by means of drying agents* like powdered talcum, lycopodium, magnesia, salicylic acid preparations, oxid of zinc and talcum, or applications of ointments of zinc or lead. If there is much pain and redness cataplasms of acetate of alumina are valuable. Licking may be prevented by painting the affected parts with tincture of aloes or asafoetida.

For further information see chapters on erythema, eczema and acne. Abscesses should be opened and treated according to surgical principles. In severe cases where there is much pustule—or abscess formation (often very refractive to treatment) bandaging and the use of "shoe" is almost imperative. See Fig. 170.

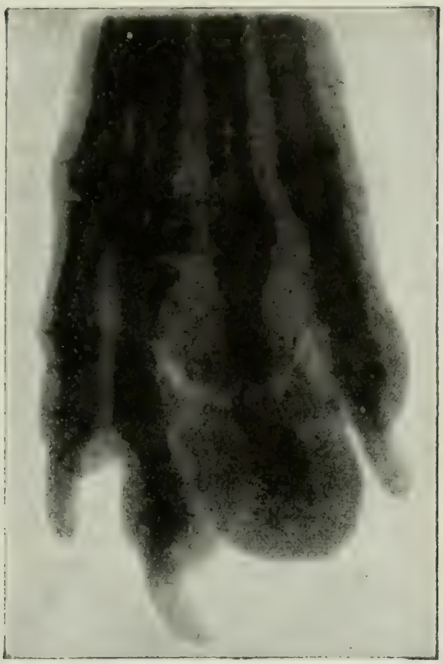


FIG. 172.—Chondroma of pad. X-ray.

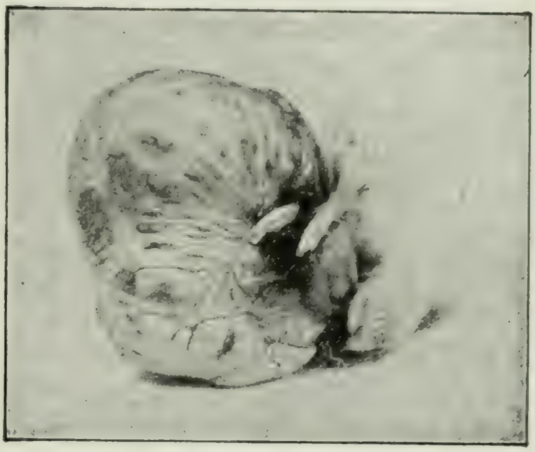


FIG. 173.—Papilloma of pad.

Other diseases of the pedal extremities.—Aside from certain lesions of the skin (tumors, frost boils or chill blains and other dermatoses) and the condition caused by infection with Achorion Schoenleini (Onychomycosis) which are each discussed in another place, inflammatory processes of the **phalangeal articulations** deserve attention. These have either an acute or a chronic course and in the latter case not infrequently cause considerable enlargement of the joints and when they are multiple they suggest **rheumatic polyarthritis.** Since lameness is frequently absent or at least only slight, these conditions are often unobserved or the true cause of the lameness may be overlooked. The chief pathological conditions observed in the bones are osteomata and chondromata (see Fig. 172) which are occasionally observed while sarcomata (not rare on the larger long bones) are exceptional in the bones of the phalanges. A papilloma of the pad is shown in Fig. 173.

HERNIAL RUPTURE.

Abdominal Hernia.

By the word "hernia" we understand a protrusion of a certain portion of the abdominal contents, usually intestines or omentum, through a normal or abnormal opening umbilical or inguinal ring in its walls, and where the displaced portion is covered, or partially covered, by the peritoneum and skin. In the majority of cases hernia appears under the external skin, although we may find it in other parts, such as hernia of the diaphragm. There are several different forms of hernia.

We distinguish the following parts in a hernia: first, the intestines or contents which protrude from the abdominal cavity; second, the hernial pouch; third, the envelope, or covering of the rupture; and, fourth, the entrance or constricted portion of the rupture, or where the intestine passes through the abdominal wall. By "hernial pouch" we mean that part of the peritoneum which is around the part protruding from the abdominal cavity, and we distinguish it where it is near the constricted portion by forming at the neck. The portion which lies in the hernial sac is the body and lower portion. The hernial pouch is absent in some cases—as a result of some injury, and the injury has been severe enough to tear the peritoneum, or where the hernial pouch collapses or draws together. Hernial coverings of the pouch are the names given to that portion of the skin and subcutaneous cellular tissues which cover that part; in some instances we also include the muscles and aponeuroses. The contents of the hernia consist of some portion of the abdominal organs enclosed in the hernial pouch. As a rule, it is the intestines, in most cases the duodenum, and in some cases the jejunum. Very frequently the duodenum may be found lying in the hernia with some portion of the large intestine or uterus, and more rarely the bladder or stomach. Under certain conditions we find a certain quantity of fluid lying in the sac. This is generally serum and originates from venous stagnation.

According to the location of the hernial orifice we distinguish umbilical, ventral, inguinal, scrotal, and hernia of the diaphragm.

The causes of hernia are generally described as direct and indirect. In the former we have a certain number of abnormalities which are due to diseased conditions. For instance, an umbilical hernia is due to an imperfect closure of the opening of the umbilical ring. The latter may occur from the abdominal walls being flaccid, from cicatricial contractions after operations, and occasionally from great abdominal pressure in prolonged straining, vomiting, etc., the muscular wall is ruptured, or from kicks or blows on the abdomen.

In traumatic hernia which has been caused by blows, the hernial pouch is sometimes absent and its contents are surrounded by a hernial envelope—in most cases by the skin—and in rare instances certain muscles are included in the sac.

Clinical Symptoms and Course.—The symptoms as well as the course show a marked difference, according to the character of the hernia, and it depends to a large extent on the "possibilities"—that is to say, if the hernia can be reduced and replaced in the abdominal cavity or not.

Reducible Hernia.—This is generally seen in the region of the wall of the abdomen. We find a swelling which does not present any inflammatory symptoms, and is especially prominent when the animal is walking or standing. It is also seen during abdominal pressure, especially after the dog has eaten a hearty meal. If the animal is turned in such a way that the hernia occupies a superior position, as a rule it immediately disappears, as the contents fall back into the abdominal cavity, or they may do so on a slight pressure of the hand. If we examine the abdominal walls the orifice of the hernia can be distinctly felt, and we may even be able to penetrate the abdominal cavity with the finger.

Further symptoms depend upon the nature of the prolapsed intestines. The intestine will be recognized as a soft, elastic swelling, having to a certain extent the round or tubular form of an ordinary intestine. It may also be further distinguished by a slight distention which is generally due to gas or air. The omentum is soft and doughy to the touch, having an uneven surface and dull on percussion. Hernias of the horns of the uterus are only distinguished from a loop of intestine after conception and during whelping.

Mechanical influences, such as bites, blows, contusions etc., may cause inflammation of the hernia with a thickening of the pouch, and an adhesion between it and the contents of the hernia. If the injury is severe enough, we may have suppuration in the pouch. In such cases we may have a subsequent mechanical contraction and reduction of the hernia, especially when the pouches are small, or in some cases the hernia has only been large enough to admit a fold of the omentum.

Irreducible Hernia.—This may be due to an adhesion of the intestinal contents with the hernial pouch, the union of the intestinal contents with each other (for instance, adhesion of the intestines), from thickening of the omentum which lies in the hernial pouch, or from strangulation of the hernia. This is especially important, as it may occur in all cases of abdominal hernia and at any time.

Concerning the causes of strangulation there are three important groups: Strangulation by extreme distention of an intestinal tube by fæcal matter; a distention of the opening of the hernia, which subsequently closes on the intestine and strangulates it; by the intestines becoming twisted in the sac. Invagination is very frequently seen in young animals.

In many cases we distinguish three stages of hernia, according to the anatomical alterations produced as a consequence of strangulation in the prolapsed parts. First, we have a venous hyperæmia, then inflammation, and lastly suppuration. In the first stage the veins and capillaries are engorged with blood, and serum is exuded in different directions. In the second stage we observe inflammation of a septic character, which extends from the mucous membrane to the serous membrane, as a consequence of the noxious or poisonous contents of the intestines. In the third stage the prolapsed parts become necrosed, due to the stricture of blood circulation. The intestinal portion becomes black, easily torn, dull in color, and covered with gray or greenish spots on its surface; the hernial fluid becomes purulent, and the inflammatory processes in the intestine above the strangulation cause septic peritonitis.

The clinical symptoms of strangulated hernia are very marked in most cases. The hernia can no longer be reduced or pushed back into the cavity, or a swelling suddenly appears after any traumatism, or after great abdominal pressure, and cannot be reduced even with careful manipulation. The hernia is distended, harder and fuller than usual, becoming very sensitive to pressure, and especially so as the inflammation becomes more intense. The skin covering the hernia is normal in the beginning, but later becomes red, swollen, and warm to the touch. Another symptom generally present is vomiting. This may be so constant and violent toward the later stages that the animal will vomit fæces. At that period symptoms of severe intestinal obstruction present themselves. The hernial swelling becomes cold, insensible to pressure, and symptoms of collapse appear, and death occurs in from twenty-four to forty-eight hours after strangulation first appears. The temperature can hardly be said to have any diagnostic value, as we very often find it normal or even subnormal up to the time of death.

In rare instances we have the formation of a fæcal abscess; this is caused by the sloughing of a certain portion of the intestine, allowing the contents of the intestine to escape into the sac; this is due to the circulation being cut off and subsequent mortification of the part; this is quickly followed by purulent inflammation of the hernial covering. If an incision is made in the hernial swelling, fæcal matter and pus flow out externally without being followed by any grave symptoms, except that it may subsequently form a false anus in the cavity.

Fæcal fistula, intestinal fistula, or preternatural rectum is seen in very rare instances. The expression "fæcal fistula" or "intestinal fistula" is used where there is an external intestinal orifice, but the greater mass of fæcal matter is passed through the rectum. The term "preternatural rectum" (anus præternaturalis) is used when all the fæcal matter passes through this opening. Such an opening may also be produced by penetrating wounds or the entrance of foreign bodies.

In strangulation of the omentum the symptoms are less marked, but there is great pain on pressure. We frequently find adhesions between the omentum and the orifice of the hernia. This inflammation produces a complete immobility of the hernia and gangrene, followed by the formation of an abscess, and finally the escape of pus externally. Death is rare in such conditions, and if it should occur it is caused by septicæmia.

The prognosis of irreducible hernia depends greatly on the length of time that the strangulation has been present and also on the character of the contents of the hernia. In cases where a loop of intestine is strangulated and is gorged with fæcal matter the results are generally serious; but, on the other hand, strangulation of the omentum is not serious.

Therapeutics of Hernia.—In cases of reducible hernia we cannot use a truss, which is the favorite mode of treatment in man, it being impossible to keep a hernial bandage steady in any position for any length of time on the dog. When hernia has been caused in a traumatic way, and followed by a subcutaneous rupture of the abdominal wall, or in umbilical hernia of very young animals, we may close the orifice in such cases by means of a dressing, and the hernia may be entirely removed by the following method:

Place the animal on its back or in such a position that the hernia is placed as high as possible. Then reduce the sac by working the contents back into the abdomen. In some cases this is accomplished very easily, but in others it requires a certain amount of careful and patient manipulation. Then place a tampon of wadding or a small piece of cardboard upon the hernial orifice. This will have to extend over the borders of the hernia far enough to entirely cover the opening. Now fix small pieces of adhesive plaster across the cardboard and attach them in a circle around the piece of cardboard. These will adhere easily if the skin has been cleansed and any fat or other material has been removed by means of ether or benzine. [Ordinary shoemaker's wax made liquid is put on the end of the plaster strips.] We now place a gauze bandage around the adhesive-plaster dressing and the whole posterior part of the body, in order to protect the dressing from being torn or shifted by the animal. The dog should be fed on light, easily digested food, avoiding any that has a tendency to flatulency or constipation, at the same time assisting defecation by means of laxatives. The safest and most certain method, however, of removing hernia is the operation of herniotomy, or hernial section.

Where we have strangulated hernia we must attempt to reduce it by pushing the contents of the hernia back into the abdominal cavity. This may be accomplished either by means of taxis or by hernial section. The former method is only to be used when the strangulated intestines have not yet undergone any serious alterations, namely, when they are not affected by gangrene, and when there are no serious symptoms of a local or general character. In the operation of taxis the patient must be placed in such a position that the hernia occupies the highest region in the abdomen and assists the relaxation of the abdominal covering and the orifice of the hernia as much as possible. We first try by manipulation upon the orifice of the hernia with one hand, and by pressure of the flat of the other upon the periphery of the swelling to push the contents of the hernia back into the abdominal cavity. When the animals are under the influence of ether or a narcotic, the reduction is easier. Taxis must be considered successful when the swelling of the hernia has disappeared and when the aperture of the hernia can be felt, and also when the symptoms of distention have gone. If the latter still continue, notwithstanding the fact that the contents of the hernia seem to have disappeared, we have a false reduction—that is to say, the hernial contents and pouch have been shoved entirely through the orifice into the abdominal cavity, or we have to deal with a volvulus or invagination of the intestinal portion in the cavity; or it may be that the hernial contents are crowded between layers of the abdominal muscles. In the first instance the orifice of the hernia seems free, and in the latter instance it is closed.

If the attempts at taxis to produce reduction fail, or if the abovementioned contraindications are present—that is, where the hernia has been left too long—we must proceed at once to perform herniotomy, which must be done under the strictest antiseptic rules.

Herniotomy is, as a rule, a rather easy operation in the dog. It may be performed in two ways: with or without opening the hernial pouch. The former is especially used in recent cases of hernia with wide orifices and in old cases of hernia with extended adhesion of the hernial contents, where the whole mass is firmly fastened together. The latter method of operation is used in cases of hernia which are not complicated with a hernial pouch, in strangulated hernia with considerable alteration of the contents, or with a very narrow hernial opening. These conditions, however, are only distinguished during the course of the operation, and we are then forced to change from the first to the second method of operation. In both methods the skin of the operated region must be shaved and carefully disinfected. We then lift up a fold of the skin corresponding with the axis and the length of the hernia and split it open with a longitudinal incision. This must be made very carefully until we reach the hernial pouch. This is recognized by its irregular surface, which is of a grayish-yellow color; also by the fact that it is impossible to get an ordinary sound directly into the abdominal cavity, and when the sac is pressed by the fingers, the hernial contents will slip back, if the hernia is an old one, it is whitish-gray in color but if strangulated, it is deep purple-red in color.

Having carefully dissected out the sac until it is completely separated from the surrounding tissue, taking care not to injure the contents, we follow one of the two methods before spoken of—that is, not opening or opening the hernial pouch.

In the former case we introduce by means of the index finger a probe-pointed bistoury or herniotome between the neck of the hernia and its orifice, turning the cutting edge of the knife toward the neck or restricted portion, the dull side of the knife being toward the hernia pouch. By means of a very small incision the tension becomes greatly relaxed, and reduction is easily accomplished. If the opening of the hernial pouch is required, we hold up one of its folds with a pair of forceps and split it by means of a knife held flat or a pair of scissors. After the discharge of the fluids in the hernial sac a notch is cut in the hernial pouch by means of the herniotome. The exposed loop of intestine is reduced by the method just described, by cutting through the constricted portion and working the intestine back in such a way that the portion of the intestine which was prolapsed last must be reduced first.

If the intestine is much distended by gas, it may be emptied by means of a puncture of a very fine trocar (or the canula of a large hypodermic syringe). Any degenerated portions of the epiploon must be amputated after being ligated. If the intestine is intensely inflamed or gangrenous, we must either resect it or make an artificial anus.

After reducing the hernia we must close the hernial orifice. This is forcibly drawn out and twisted round and round in a spiral direction, and a single or double ligature applied as high up as possible. In cases where no hernial pouch is presented or it has been shoved back into the abdominal cavity it is advisable to freshen the borders of the orifice by means of a blunt knife or curette; then stitch it up by a continuous suture of catgut. After thoroughly disinfecting it for the second time, the external wound is to be stitched and covered with an antiseptic dressing held in position by means of a bandage (eight-tailed) around the body.

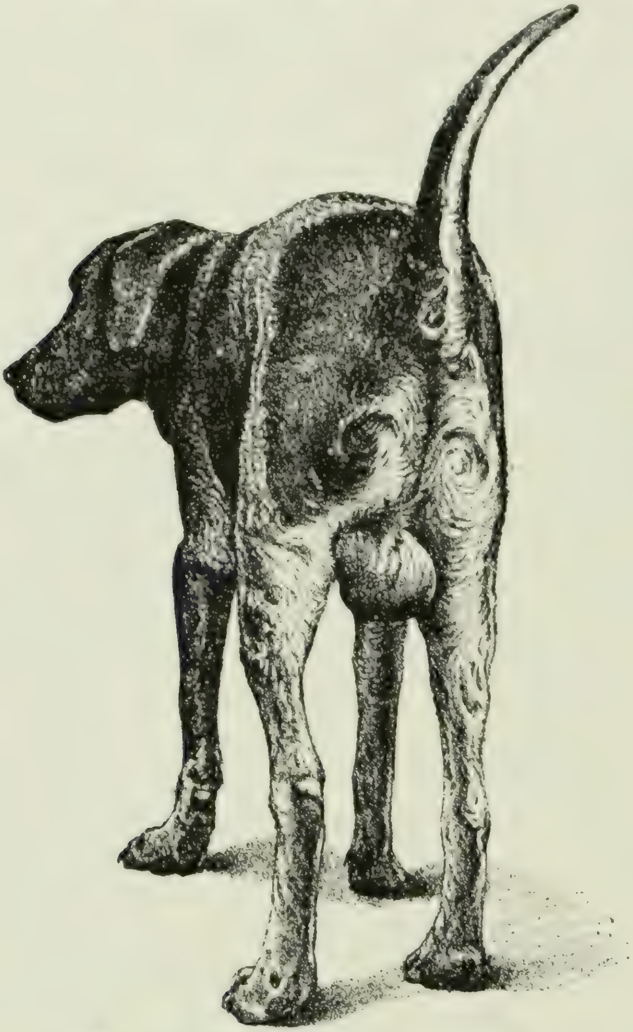


FIG. 174.—Scrotal hernia of right side.

Inguinal and Scrotal Hernia.

(*Hernia Inguinalis and Scrotalis.*)

The inguinal canal of the dog is located in the abdominal muscles with the seminal cord, and runs from the testicles into the abdominal cavity. In the bitch we find a round ligament from the end of the Fallopian tube toward the subcutis. Inguinal hernia may be produced by a portion of the intestine passing from the abdominal cavity into the inguinal canal. If this is the case in the dog, and the loop of the intestine goes as far as the scrotum, we call it scrotal hernia. If it simply lies in the canal, it is called inguinal hernia.

Clinical Symptoms of Inguinal and Scrotal Hernia in the Male Dog.

This condition is very rare in the male; most cases are congenital; the contents are generally small intestine and omentum. In an ordinary case of inguinal hernia, we must understand that from the external abdominal ring as far as the scrotum the canal is almost cylindrical, and we find tnat when this canal is filled either with a loop of small intestine or omentum it has a peculiar elastic softness and "doughy" feel under the skin. There is generally no local increase of temperature. In large hernias we may reduce this partially or altogether by placing the animal on its back and holding up the hind quarters and gently pressing or rubbing with the finger upon the hernial swelling. If the intestine has entered the scrotum (Fig. 174), the affected side appears full and large, and may be reduced by the manipulations indicated above. In hernias of this character the testicle is apt not to descend into the scrotum, and is soft, immature, and can be distinguished in the canal. The abdominal ring is found to be larger than natural. In cases of strangulation the symptoms which have been described before become apparent, and, if the symptoms are very acute and all attempts at reduction are futile, we must perform the operation of castration.

Castration of the Male.—In normal conditions—that is to say, when no hernia is present—castration of the dog must be performed by laying the animal on his side, rendering all the parts aseptic, and holding the skin tightly over the testicle, compressing it between the finger and thumb. Then make an incision the entire length of the scrotum, cutting through the scrotum, the tunica dartos, and tunica vaginalis, so that the testicle is exposed (compare with Fig. 175).

The testicle is drawn out and then the common intersecting membrane is opened up as far as possible by means of a pair of scissors; then place a strong silk suture around the seminal cord, close up to the inguinal ring, and ligate it. When this is done, the seminal cord, with all the superfluous portions of the interstitial membrane, is amputated about 1 cm. below the ligature. The other testicle must be removed in the same manner. After carefully cleansing the wound with a strong non-irritant disinfectant, the wound of the scrotum has to be closed with an ordinary stitch, and it is advisable to place a small drain, like a silk thread, into one of the corners of the wound. No dressing is required provided the animal is muzzled. Healing occurs generally within a few days. If, however, we have a case in which we wish to operate for inguinal or scrotal hernia, we deviate from the above-described method of castration by ligating the intersecting membrane externally and as close as possible to the external inguinal ring, having first twisted the sac several times, the wound is sewed up and a bandage put on for several days. In valuable breeding animals the testicle of the affected side only is removed.

Inguinal Hernia in the Bitch.—This is generally observed in bitches that have had puppies, although it has also appeared early in life from no apparent cause. It is also congenital. Gutman saw a bitch three months old that had an inguinal hernia. This condition is either lateral or bilateral. The hernial sac in this condition is double, the internal being peritoneum, the external the skin and part of the mammary gland. In a hernia of any size we find it invariably contains the uterus, particularly when that organ is heavy with fœtus, or other abdominal organs, for instance the bladder, loops of intestine, or the omentum. Cadéac found in a unilateral inguinal rupture the size of a child's head on the right side, the entire intestinal tract and on the left side the omentum, the spleen, uterus and the bladder. An

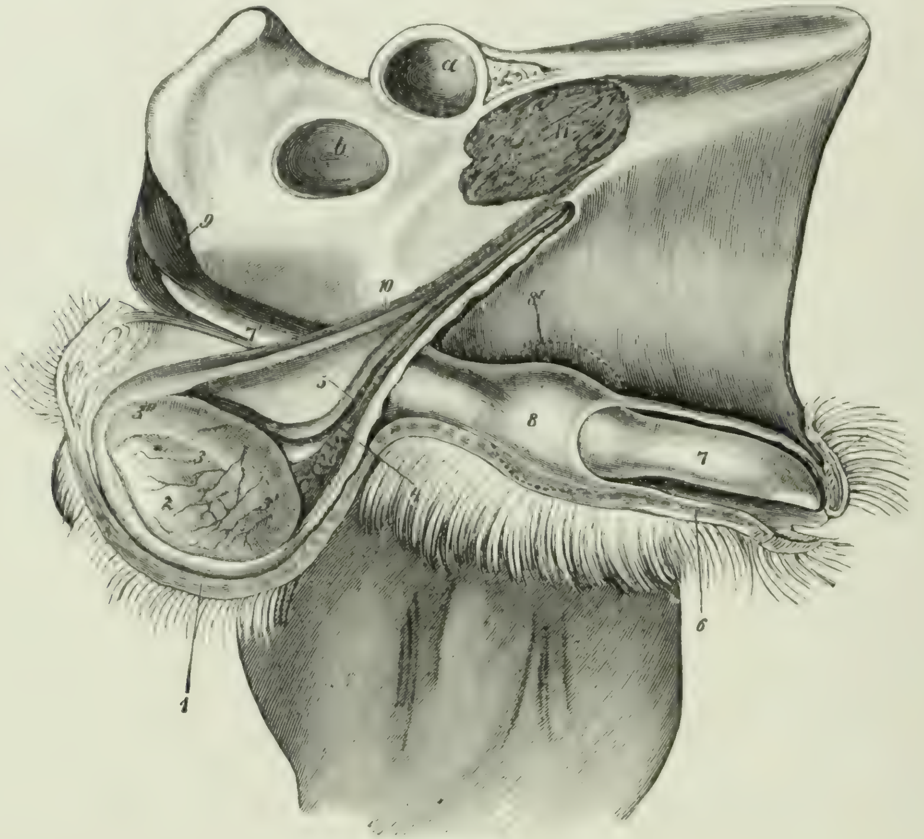


FIG. 175 —Genital organs of the dog: 1, Scrotum opened; 2, right testicle; 3, body of the epididymis; 3′, globus major and, 3″, globus minor; 4, spermatic cord; 5, vas deferens; 6, prepuce (partially dissected); 7, free portion of the penis; 7′, posterior attachment of the penis; 8, erectile masses (bulbous bodies); 8′, size of erectile masses when distended by blood.

inguinal hernia in the bitch if it is of any size is easily recognized (Fig. 176). It is found in the posterior part of the mammary gland, an enlargement varying in size, elastic, painless, with no increase of the local temperature. When the animal is placed on her back, it either returns to its normal position by natural gravitation or else it is reduced with very little manipulation. On the return of the contents of the hernial sac the abdominal ring is found to be very much dilated above normal. In rare instances it may be found impossible to reduce the hernia entirely, and this is found to be due to certain adhesions of the abdominal contents to the pouch or else to a pregnant uterus; in the latter case the fœtus can easily be detected by manipulation. In certain cases where there is a doubt as to the exact nature of an enlargement in the position of inguinal hernia, if it is the uterus in the sac, on introducing the finger into the vagina, that is found to be elongated and deviated to one side, due to the stretching and weight of the uterus, and it is also found that it is impossible to reach the os uteri with the end of the finger. In very rare cases when the round ligament of the uterus (false inguinal hernia) is greatly hypertrophied, it might be possible to mistake it for inguinal hernia. (False inguinal hernia.) As a rule inguinal hernia in the bitch is rarely involved in strangulation, and if she should be in whelp, she has her puppies without trouble.

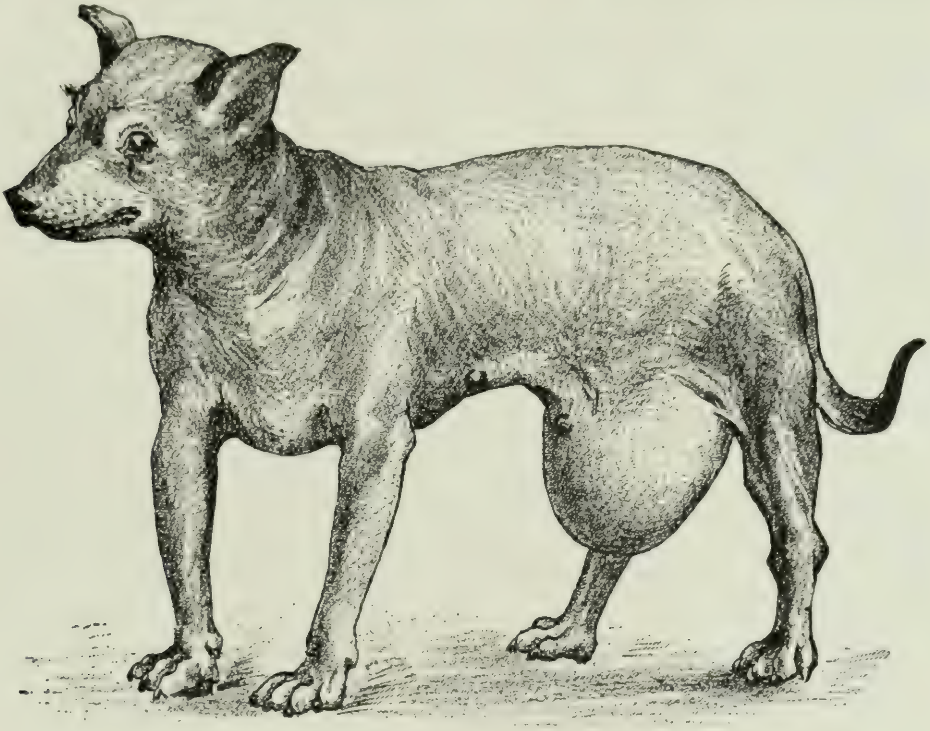


FIG. 176.—Inguinal hernia of bitch.

A bitch affected with inguinal hernia must be carefully fed, avoiding food that is hard to digest, or has a tendency to cause flatulence or to constipate. If it becomes necessary to remove the hernia, either from size or strangulation, herniotomy should be performed with the animal under an anæsthetic, and operated on as already described (see Herniotomy).

Sarcocele.—This is a collective name for all kinds of tumors of the testicles, especially for sarcoma, carcinoma, enchondroma, and cysts. The testicles are swollen, the swelling, as a rule, being hard, tough, and sometimes fluctuating; never warm or very painful. The condition can only be remedied by castration.

Hydrocele.—By this we define an accumulation of fluid (serum) in the scrotum. The affection is often associated with œdema of the lower extremities and of the scrotum. It is frequently seen with ascites, hydrothorax, etc., appearing in the shape of a fluctuating swelling of the testicular pouch, which disappears when the animals lie on their backs.

Therapeutic Treatment.—This consists of puncture and emptying of the sac, also injection with any of the following stimulating fluids; alcohol, Lugol's solution, carbolic acid (1 to 40), etc. Of course, these are only to be used when castration is not performed.

A variety of hydrocele is seen where we have œdema of the spermatic cord. This appears as a fluctuating swelling which may be easily moved from one side to the other. It occupies the whole length of the spermatic cord, and, as a rule, is never interfered with. When the fluid of the hydrocele, which is discharged by puncture, consists of bloody serum, we call it hæmorrhagic hernia, or hæmatocele. Any other complications of the testicles and their membranes may be found on page 208.

Umbilical Hernia.

(*Hernia Umbilicalis*).

The hernia ring is formed by the umbilical ring. The contents may consist of the omentum, duodenum, and in rare cases of the large intestine. In the hereditary form the intestines are located in the umbilical cord, and are not covered by the abdominal membrane (hernia of the umbilical cord). In accidental hernia of the umbilicus, we always have a hernial pouch, originating from the peritoneum. As a rule, umbilical hernia occurs a few days after birth. It may increase gradually and become eventually strangulated, but it often disappears without any surgical interference. Hernia of the omentum we see occasionally, but generally it cures itself by an adhesion between the hernial pouch and the hernial ring. Umbilical hernia is easily recognized (Fig. 129). We find a swelling under the umbilical ring, which may vary in size from a hazelnut to a walnut.

Therapeutics.—Treatment consists, as a rule, in very young animals, of the application of a bandage over the hernia and kept there for three or four weeks, thus holding the abdominal contents back and allowing the opening to close spontaneously. The bandage consists of a tampon of lint which is fixed to a piece of rubber adhesive plaster or, better still, the round top of a bicycle repair plug with the stem cut off, then adhesive rubber plaster is placed in strips in a circle, as per Fig. 178. Before applying the plaster it is well to clean off the skin on the region of the umbilicus with ether or benzine to get better adhesion. Shoemaker's wax is also used as an adhesive substance. It is best to put a strip bandage around the body to retain the bandage in position.

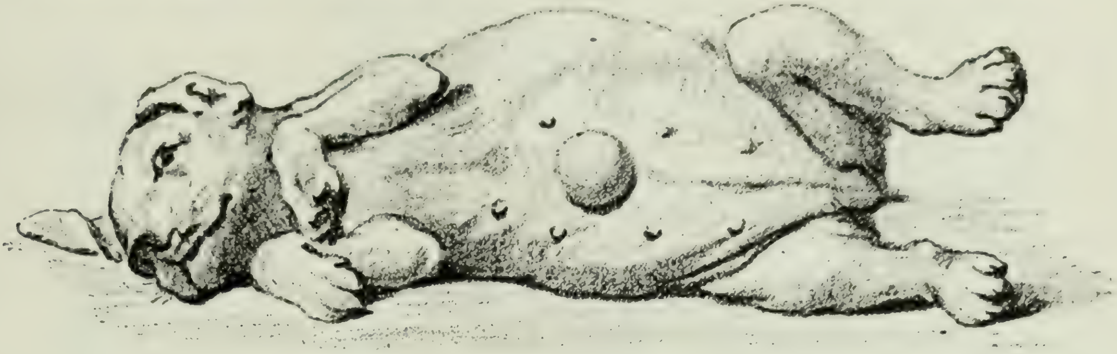


FIG. 177.—Umbilical hernia.

Another more certain method is to place the animal on his back, reduce the hernia; the hernial pouch is pulled away from the body, and a needle carried through the centre of the base of the sac, the thread is cut through at the needle and then each side of the ligature knotted, dividing the tumor. Almost immediately the tumor dries and mummifies, and in a week or ten days falls off with the stitches, leaving a raw surface which is painted with compound tincture of benzoin daily and soon dries up. Care is to be taken to prevent the animal licking or chewing the part until it is healed.

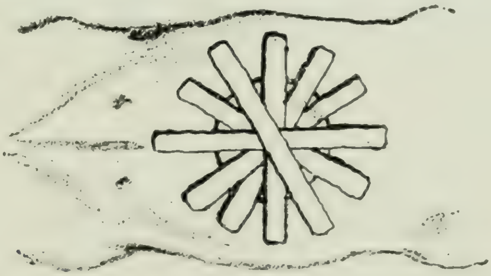


FIG. 178. Plaster on umbilical hernia.

Injections of corrosive substances, such as solution of chromic, nitric, or sulphuric acid, are not to be recommended, as likewise are salves of cantharides, collodion, subcutaneous injections of absolute alcohol, chloride of zinc or chloride of sodium.

Femoral Hernia.
(*Hernia Cruralis.*)

Femoral hernia is extremely rare in the dog. The ring is formed by the upper end of the so-called femoral canal, and is formed by the crural fascia, the external membrane forming the hernial covering. The femoral canal of the dog is a long, three-cornered cavity in the median surface of the upper part of the leg, which is surrounded front and back by the inverted muscles of the upper thigh—that is to say, in front by the sartorius muscle, and back by the long abductor, the large and short abductor, and on its upper surface by the ilio-psoas, while the floor of the cavity is formed by a portion of the muscles of the thighs and by the crural fascia. Below the borders of the sartorius the abductors run together at an acute angle (Fig. 180). This canal, as a rule, is filled with masses of fat, nerves, and blood vessels. In cases of fracture of the pelvis the intestines which leave the abdominal cavity, after having followed the direction of the large blood vessels, locate themselves in this cavity and are covered by the peritoneum, the crural fascia, and external membrane; but they may also under certain conditions penetrate directly under the skin through an opening of the crural fascia.

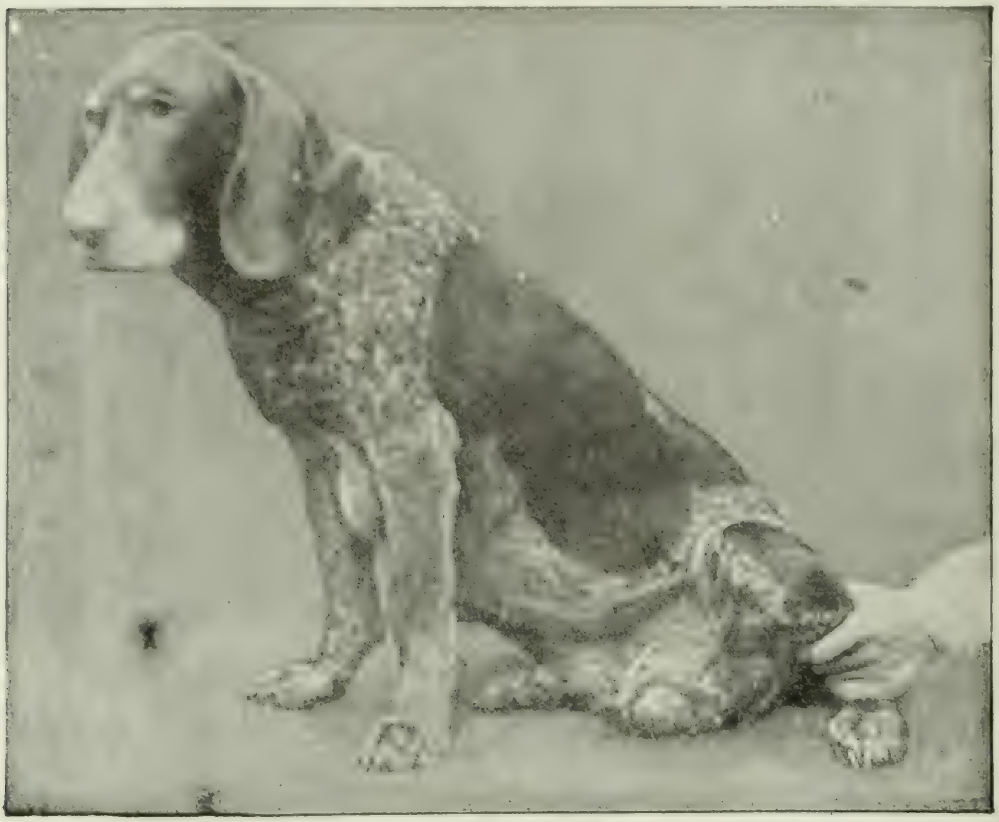


FIG. 179.—Umbilical hernia of bitch with fibroma on sternum.

In the inner fascia of the thigh we find a soft swelling which has more or less pain when the condition is examined and the disease has been of recent origin, and in cases of strangulation. In the latter cases, however, we see also a peculiar dragging motion of the thighs, with lameness and symptoms of intestinal obstruction, such as vomiting, etc. Herniotomy has to be performed according to the rules mentioned before, but must *only be attempted* in extreme cases. In making incisions into this region great care must be taken to avoid the large blood vessels which pass into and through the femoral canal.

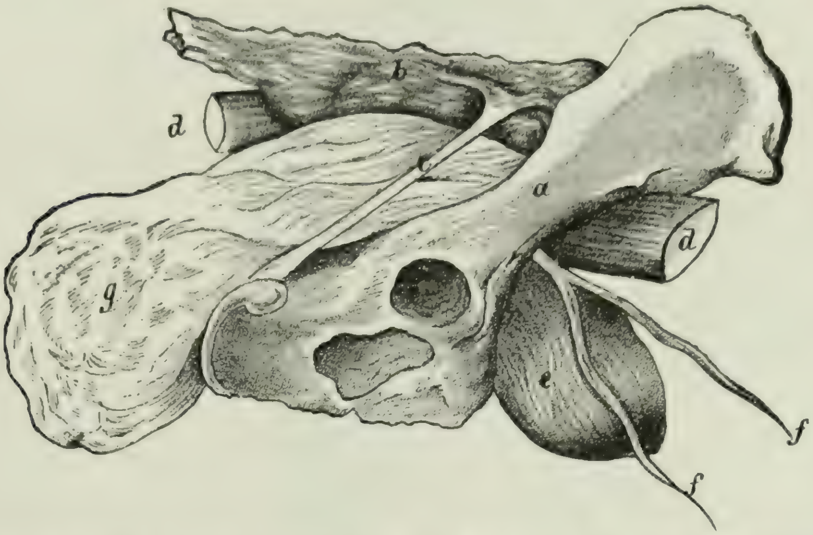


FIG. 180.—Perineal hernia on right side; *a*, Pelvis; *b* sacrum with anterior, coccygeal vertebra; *c*, broad pelvic ligament; *d*, anus; *d'*, posterior portion of the rectum; *e*, bladder; *f*, *f*, seminal vesicles; *g*, sac of the perineal hernia.

Perineal Hernia.

Perineal hernia occurs in both dogs and bitches. In the former it is recognized by a peculiar bulging or lifting of the excavatio recto-vesicalis, and in the latter by a bulging of the excavatio vesico-uterina, more rarely of the excavatio recto-uterina. In both cases we observe prolapse of some portion of the bowel, and sometimes in the dog we observe a prolapse of the bladder; in the bitch, possibly the uterus also.

In the dog we recognize perineal hernia by a soft swelling the size of an egg or the size of the hand. This appears in the side and above the anus, between the root of the tail and the tuber ischii (Fig. 181). In the bitch this hernial swelling is seen under the vulva the lower portion of which is not infrequently also prolapsed. This hernia can only be removed by means of an operation, and unless it is either very large or shows indications of strangulation, it had best be left alone. To operate the parts should be thoroughly cleaned with antiseptic washes, the skin shaved, the animal etherized, and an incision made in the skin, then the hernial sac is emptied of its contents and the sac pulled out as far as

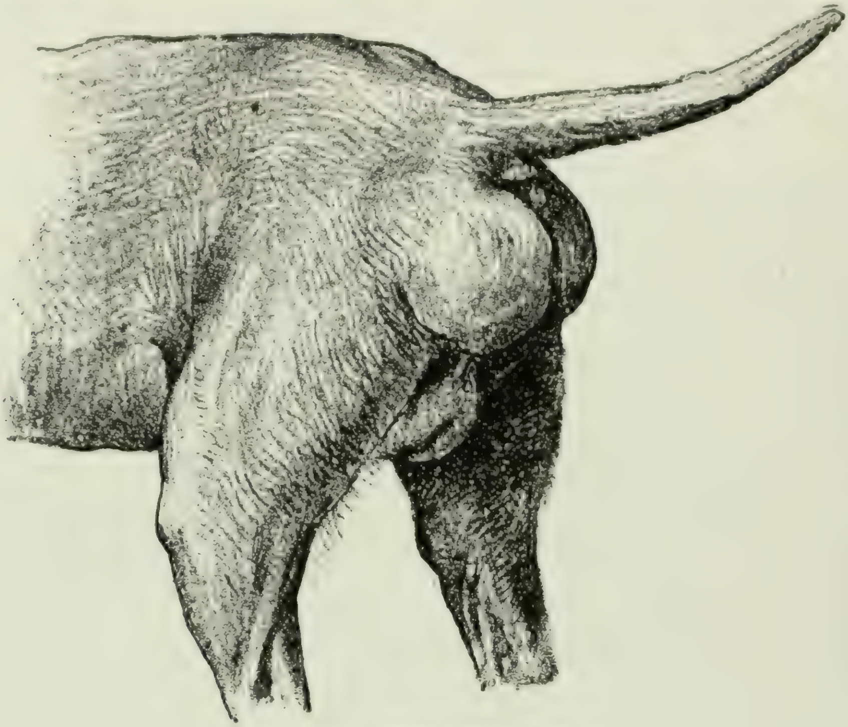


FIG. 181.—Double perineal hernia.

possible, and ligated and the free part of the sac cut off. In case there are adhesions between the contents of the sac and the sac itself, the pouch must be opened and the adhesions carefully torn away, and pushed back into the abdominal cavity, the pouch ligated as already described. Morphine for a few days to prevent straining.

DISEASES OF THE EYES.

AFFECTIONS OF THE EYELIDS.

Adhesion of the Eyelids. Ankyloblepharon.

It is a well-known fact that puppies are born blind—that is to say, the palpebral fissure is closed at birth (atresia palpebrarum). This is not a simple agglutination of the eyelids, but a true adhesion of the membranes. This has been proven from the fact that if they are forcibly separated after birth, the cornea has an opaque look and the edges of the eyelids bleed. As a rule, the fissure opens in from seven to twelve days. It is very rare that we have an obstinate closure of the eyelids. If this should be the case, we try to produce separation by means of emollients, tepid water, and careful tension upon the eyelids. If these are not successful, the eyelids must be separated by means of a pair of scissors or a probe-pointed curved bistoury. Then we rub the edges of the wound with vaseline or, if they persist in uniting, with caustics, nitrate of silver pencil, in order to prevent an adhesion. Caution in regard to cornea when using caustics. In very rare instances, as a consequence of traumatisms, burns or excoriations, we may find more or less adhesion and narrowing of the lids (ankyloblepharon, blepharophimosis).

Entropion—Turning In (Inversion) of the Eyelid.

By this term we understand a turning or wrinkling of the eyelid in such a manner that the edge of the lid is directed toward the eyeball and the eyelashes come in contact with the conjunctival tissues and cornea. Entropion occurs quite frequently, especially in bulldogs, Newfoundlands, setters, Great Danes and spaniels, although it may be present in all breeds. In some cases it is present at birth, or it may be developed by constant convulsive closing of the fissure of the eye (blepharospasmus), due to some chronic irritating conditions of the cornea or conjunctiva (conjunctivitis chronica, conjunctivitis follicularis). It is occasionally caused by cicatricial contraction of the conjunctiva of the lid, after injuries, such as the result of caustic substances getting in the eyes, burns, or some chronic inflammatory condition, or to atrophy of the eyeball. The more relaxed the cutaneous tissue may be in the neighborhood of the eyelid, the more obstinate the diseased condition is to treat. Haltanhoff considers that the tendency to entropion is hereditary.

Clinical Symptoms.—As a rule, the inversion of the lid occurs more frequently in the upper than the lower eyelid, but we may also see both affected at the same time. Sometimes we see a lateral inversion of the eyelid. This is extremely rare, however. A symptom observed is constant irritation, which is caused by the hair of the lashes being directed toward the cornea. We also see a marked increase in lachrymal secretion, a twitching and convulsive compressing of the eyelids, and a thick, gray, purulent mucus accumulates in the corners of the eyes. The hairs of the eyelashes become adherent, and the eyelids may become completely glued together. Besides this we see an intense inflammatory condition of the connective tissue, and in some cases inflammation of the cornea, and in extremely bad cases ulceration (ulcerative keratitis).

The prognosis may be favorable when we operate at the proper time, but relapses are not rare, especially in dogs which show a peculiar wrinkled condition of the facial membrane. We may expect a relapse in such cases where we do not entirely remove the conjunctivitis (primary or secondary) at the same time as the entropion.

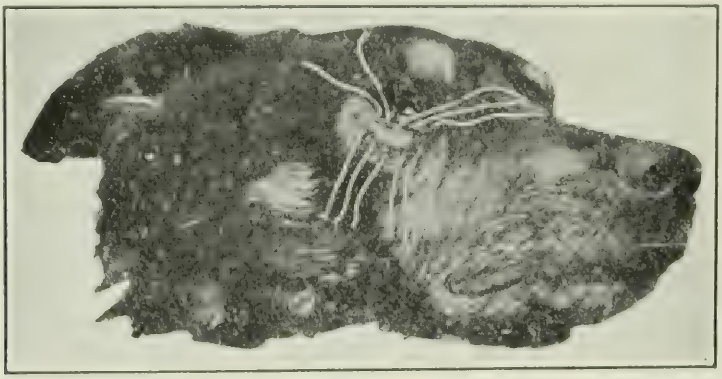


FIG. 182. Entropion operation of lower eyelid.

Therapeutics.—It is only in fresh and very mild forms of the disease that we may expect to obtain any favorable results by means of medicinal treatment, and this must be directed toward removing the conjunctivitis which exists in conjunction with entropion, otherwise an operation alone will answer.

The following methods of operation are suggested:

The best method is to carefully remove the hair and thoroughly disinfect the surrounding tissue, then, with the patient under the influence of morphine, a fold of tissue running parallel to the edge of the lid is picked up by means of a pair of entropion or ordinary artery forceps, the fold of skin lifted being sufficiently large to make the lid lie in its normal position, care being taken not to include the conjunctiva, and this fold is cut at the edge of the forceps; there must be at least 0.5 cm. between the edge of the wound and the edge of the eyelid; the hemorrhage must be completely controlled before the wound is closed with several silk sutures (Fig. 182). Where there is extensive inversion of the lid, it is best not to attempt to remove too large a portion of the lid, but divide it into two portions and equalize the tension, as illustrated in the accompanying figure. The portion may be removed either on the upper or lower lid, and also at the lateral corner of the eye a portion in a vertical position can be removed, and in extreme cases of entropion, all three excisions can be performed (Fig 183). Another method recommended by Schleich consists in removing a piece of skin in the form of an arrow-head (see Fig. 184) and uniting the edges with sutures.

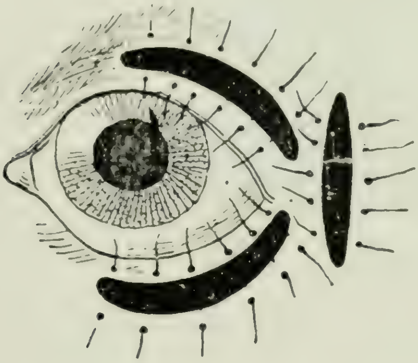


FIG. 183.

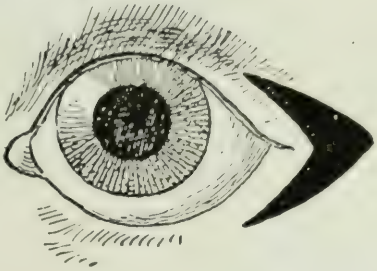


FIG. 184.

FIG. 183. —Diagrammatic position of sections and mode of stitching in the operation for entropion (*G. Müller.*)

FIG. 184. —Diagrammatic position of section in operation of entropion. (*Schleich.*)

The simple removal of the inverted eyelid by means of scissors, is undoubtedly the simplest method, but it is very evident that not only is the appearance of the animal very much impaired by it, but that the eyeball may be constantly irritated and there is a constant flow of tears on account of the insufficient closure of the lid.

Tying up small portions of the lid, by means of needles, or the method recommended by Brennen of burning a series of lines on the lid by means of thermo-cautery, which afterward heal and by cicatricial contraction draw the lid back, are not as efficacious as the proceedings first described.

Ectropion—Turning Out (Eversion) of the Eyelid.

This condition is, as a rule, in the lower lid, the free edge of the lid being turned out from the eyeball toward the external side of the eyelid. This is generally noticed in bulldogs, St. Bernards, and setters, especially so in animals that have sunken eyeballs. It may be due to an alteration or partial paralysis of the palpebral muscles. Sometimes it may occur from the shape of the cartilage, which does not consist of a firm disk, but of bunches or collections of connective tissue mixed with elastic fibres. In some cases it may be caused by a contraction of some of the tissues of the face, especially from cicatricial contraction, as a result of wounds or burns. It may also be due to a loosening or softening of the tarsal cartilage as a result of prolonged conjunctivitis.

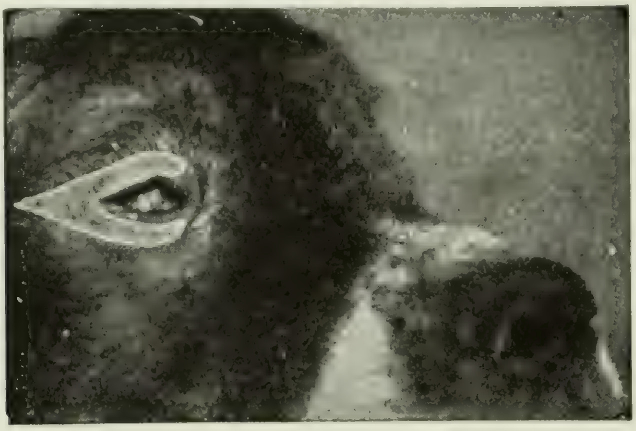


FIG. 185.—Entropion operation according to Jakob.

Clinical Symptoms.—The affected eyelid is turned up and out, so as to show the conjunctiva. The latter is inflamed from the action of the air and is more or less reddened, and at the same time there is considerable secretion of mucus and tears along the cheeks (lachrymal eyes).

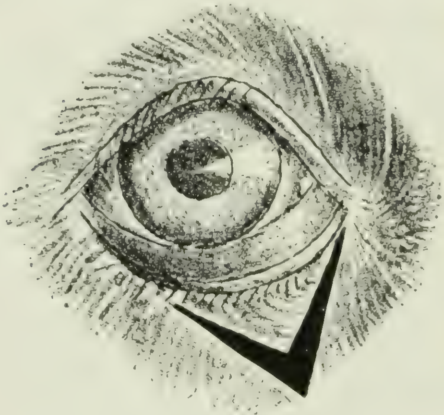


FIG. 186.

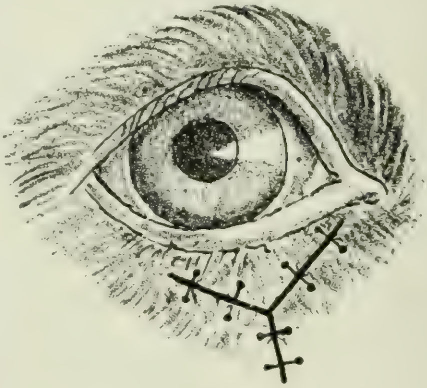


FIG. 187.

FIGS. 186 and 187.—Ectropion operation and mode of stitching. (*Cadiot-Breton.*)

Therapeutic Treatment.—If it is due to conjunctivitis, we must first endeavor to reduce it by "touching" the connective tissue of the eyelid with a pencil of nitrate of silver or sulphate of copper, or by removing a portion of the mucous membrane of the lower eyelid. This, however is extremely hard to do, and as a rule it is not advisable. If these measures are useless, or if they seem doubtful from the onset, Moller recommends to excise from the external half of the affected lid an arrow-shaped or nearly triangular piece of skin and unite it by means of sutures (Figs. 186, 187). Frick's method of excising two crescent-shaped pieces of skin whose concavities are toward the lid and meet at an angle, 2 to 3 cm. from the edge of the lid, and uniting the edges by means of button sutures, has not been found to be as satisfactory as the first-mentioned operation.

Inflammation of the Eyelids. Blepharitis.—This condition appears as an inflammation of the external covering of the lid (B. superficialis), inflammation of the cellular tissue of the lid (B. profunda), and inflammation of the edge of the lid (B. ciliaris). Superficial inflammation of the lid is generally caused by some irritation that involves the skin of the surrounding tissues, such as eczema or parasitic mange, particularly sarcoptic or dermodectic mange (B. acarica). General inflammation of all the structures of the lid is caused by direct traumatisms, bites, tears from sharp objects, and is invariably accompanied with pronounced tumefaction and subsequent suppuration; sometimes it may even terminate in an abscess. Inflammation of the edge of the lid is generally confined to the affected edge and is covered by a tenacious purulent mucus that sticks the edges of the lid together; this secretion varies in color, at first grayish-yellow, then light brown and finally dark reddish-brown.

The treatment consists first, in frequent fomentations of boracic acid solution, or strong infusions of ordinary tea, with a pinch of borax in it, and the edges of the lid should be covered with ointment of red oxide of mercury. General inflammation of the lid (B. profunda) should be treated with warm fomentations and if an abscess forms it should be opened as soon as it points. B. acarica is taken up under parasitic skin diseases.

Hordeolum. Sty.—Sty is due to an inflammation of one of the glands of the hair follicles of the eyelash or of a Meibomian gland. It is indicated by a small bright red globular circumscribed tumor on the edges of the lid, with more or less redness and tumefaction of the surrounding tissues. It may be chronic (chalazion), but that is extremely rare.

The treatment consists in warm application of boracic acid solution applied frequently, and if an abscess has formed it must be carefully opened by means of a fine needle; forcibly squeezing the lid to evacuate the contents does more harm than good. In chronic cases remove the tumor.

Ptosis.—This is a drooping of the upper eyelid. We distinguish **true ptosis** which is due to oculomotor paralysis (paralysis of the M. levator palpebrae superioris) or to facial paralysis (paralysis of the M. corrugator supercilii) and false or spurious ptosis (*pseudo ptosis*) which may be due to the presence of tumors or to inflammatory swelling of the upper eyelid. When due to facial paralysis the lower eyelid also droops and the condition is therefore associatd with **lagophthalmus** (inability to close the eye). In true ptosis the faradic current or strychnin (subcutaneously) may be tried. In pseudo ptosis the removal of the offending tumor or treatment of existing conjunctivitis is indicated.

Tumors.—Among tumors of the eyelids we have warts, which consist of flat or pedunculated, usually more or less pigmented, structures, ranging in size from that of a pea to a hazelnut and with rough or cleft surface; also fibromas, sarcomas, carcinomas, and (in white-haired dogs) melano sarcomas. Treatment must be surgical.

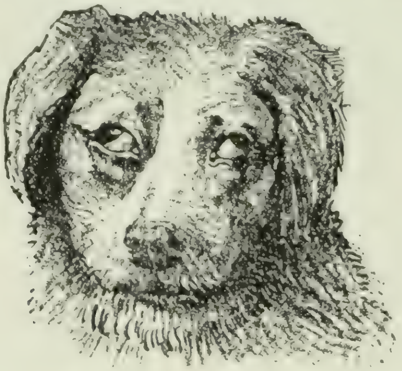


FIG. 188.—Protrusion of the membrana nictitans in young dog.

Diseases of the Lachrymal Organs and the Membrana Nictitans.—The lachrymal organs are very rarely affected in the dog. Inflammation of the lachrymal duct (dakryocystitis) generally appears as a secondary complication of catarrh of the conjunctiva. It appears as a round circumscribed tumor, which is immovably fixed in the corner of the eye, and on pressure a quantity of mucus or muco-purulent fluid exudes from the lachrymal opening. In acute inflammation of the duct, if the end of the duct is closed by inflammatory processes, it is apt to break out through some portion of the duct, which may discharge a muco-purulent fluid for a time or else form a permanent fistula (lachrymal fistula); this condition is extremely rare, and occasionally we may find that an abscess at the root of one of the molars has caused a fistulous opening near the canal; careful probing with a sound will generally enable one to make a correct differential diagnosis.

Stenosis and obstruction of the lachrymal canal is due to inflammation of the mucous membranes, traumatisms, foreign bodies, tumors. Closure of the opening of the canal is indicated by the constant flow of tears from the internal angle of the eyes, irritation of the skin, and loss of hair below the opening.

Hypertrophy of the lachrymal canal is due to various inflammatory processes or neoformations.

The treatment of closure of the lachrymal canal is a very difficult and delicate operation to handle. It consists in trying to establish a new opening into the nasal cavity and direct the tears into it.

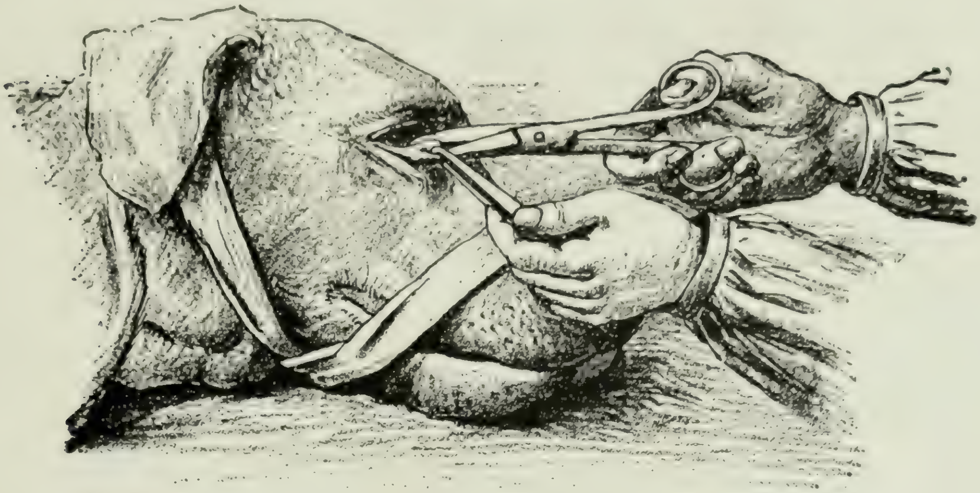


FIG. 189.—Removal of the membrana nictitans.

Diseases of the Membrana Nictitans.—Irritation of this organ may result from various pathological processes which affect the conjunctiva, the membrana nictitans being covered on both surfaces by that membrane. Follicular conjunctivitis frequently causes the formation of various sized nodules (hypertrophied follicles) round bodies about the size of a millet seed, deep red in color, and may sometimes produce a tumor which is visible in the internal canthus of the eye. When the membrane is picked up and examined by means of a pair of forceps, and enlargement of the membrane is indicated by a pink red tumor in the internal corner of the eye, which moves over the eyes on slight pressure on the eyeball; this tumor not only originates from follicular conjunctivitis, but from traumatic causes and neoformations such as adenomas of Harder's gland, lipomas or papillomas. A prolapse of the membrane without any hypertrophy is seen frequently in St. Bernards, retrievers and mastiffs, when the enlarged membrane lying over the eye gives the animal a sleepy looking eye, or "dead eye" (see Fig. 188).

Treatment.—Astringent washes of boracic acid, zinc, lead, etc., may reduce this irritation, but, as a rule, if this hypertrophic condition of the membrana nictitans is once established, removal of it by surgical means is the only way to establish a permanent cure. The eye is first treated by a few drops of 4 per cent. solution of cocaine, and then the enlargement is seized by a pair of forceps and by means of curved scissors clipped off (Fig. 189). Putting a thread through the tumor by means of a curved needle enables the operator to make a much evener removal of the tumor and is preferred to holding it with forceps by some operators. The hemorrhage is insignificant and is controlled in a few minutes. If it should persist for some time, put a few drops of acetate of lead solution on the eye and keep the lid closed for a few moments by means of a pledget of cotton. Heroic but effective treatment of chronic follicular conjunctivitis consists of carefully everting the diseased membrana nictitans with the aid of flat forceps, cauterizing with a pencil of silver nitrate followed immediately with flooding of the treated area with a strong (10%) solution of sodium chloride (to protect the cornea from the action of the free silver nitrate). Practically no after treatment is necessary.

DISEASES OF THE CONJUNCTIVA.

Inflammation of the Conjunctiva—Conjunctivitis.

(*Conjunctivitis; Syndesmitis.*)

Inflammatory conditions of the conjunctiva are the most frequent affections of the eye in the dog, and appear in various ways according to their cause. Under ordinary circumstances we see the development of a simple catarrh of the conjunctiva, which, like all catarrhs of the mucous membrane, causes swelling, great redness, and formation of loose folds of tissue. The redness may vary from a slight injection to a dark or bluish-red coloration. This is, as a rule, regular and rarely spotted with blood extravasations. The secretion of the mucous membrane is sero-mucous in the beginning, but later on becomes muco-purulent, and in some cases there is a peculiar grayish secretion. This secretion becomes agglutinated to the interstices and corners of the eyelids, producing a gluing together of the lashes, and during the night, when the animal is asleep, it dries up, forming a grayish-yellow adhesive mass. The inflammation is usually restricted to the conjunctiva of the lid, the transition fold and the bulb of the conjunctiva being very rarely affected. The follicles of the connective tissue are generally swollen in all prolonged forms of catarrh of the eyes. Sometimes they protrude here and there from the reddened connective tissue in the shape of a millet-seed or a sago granule.

In cases where the irritation is due to the influence of some infectious, pathological microorganism or bacteria, which are always present on the conjunctival membrane, we notice a marked cellular infiltration of the tissues of the mucous membrane, with proportional swelling of the connective tissue, and the production of a copious thick, yellowish-green secretion. Under the influence of chemical irritants we have the formation of grayish-white or transparent membranous accumulations upon the surface of the mucous membranes, and sometimes ulcers which may lead to *trichiasis* (turning in of the hair of the lashes toward the bulbs; the mildest form of entropion). In some cases it may cause a natural entropion or symblepharon adherence between the lid and bulbs of the conjunctiva. The cornea and the conjunctiva being in such close proximity to each other, an inflammatory process in one is very apt to produce a similar condition in the other.

The following forms of conjunctivitis are observed in the dog:

Catarrhal Conjunctivitis (*Conjunctivitis Simplex*).—By this we mean an acute catarrh with intense redness and loosening of the conjunctiva, also copious mucous or muco-purulent secretion. The local disturbances do not seem to be very marked, but we see in rare cases irritation with itching, the patients attempting to rub their eyes with their paws.

Etiology.—Catarrh of the eyes may occur at any period of the animal's life, and, as a rule, affects both eyes; in very rare instances only one. It is generally the result of exposure to cold or the influence of sharp, cold winds. It is, therefore, apparent why it appears at certain seasons of the year more than at others, that is, in the spring and fall. Mechanical and chemical influences also produce a certain effect, such as foreign bodies (dust, hair, etc.), turning in of the eyelashes (trichiasis), smoke of soft coal, etc.

Catarrh of the conjunctiva is intimately connected with catarrh of the respiratory organs, such as nasal catarrh, distemper, and all serious internal diseases which have a prolonged course.

Symptoms and Course.—Pain and twitchingof the eyelids, which is more pronounced if foreign bodies are present in the conjunctival membrane. In the early stages there is a slight increase of the flow of tears, later it becomes mucous and finally we observe a muco-purulent discharge which is very tenacious and frequently the eyelids stick together, the discharge frequently flowing down the face, and the conjunctival membrane becomes greatly swollen and injected. This condition may become chronic, lasting in a modified form the whole course of the animal's life. Frequently there is intense itching, causing the animal to continually scratch the affected eyes with his paws, and rub them on the ground, producing considerable increase of the irritation already present. When the affection extends to the cornea, it may become opaque, and in more severe cases cause ulceration of the cornea (see Keratitis).

Conjunctivitis follicularis of the membrana nictitans is a variety of this disease (catarrhal conjunctivitis) that is generally chronic. This is indicated by the appearance of large numbers of lymphatic follicles upon the internal surface of the membrana mictitans. These follicles stand out distinctly in the form of millet-seed bodies upon the surface of the membrane. They are dark red and transparent, consisting of ball-shaped accumulations of lymphoid cells. Soon they appear in numerous masses, giving the membrane the appearance of a granulating wound surface, and in such cases the membrana nictitans is pushed out from the bulbous and extended over the cornea. The question whether this condition is a form of follicular conjunctivitis or it is to be accepted as a disease *sui generis*, we have not been able to determine fully, but we know that the presence of numerous lymphatic follicles prolongs indefinitely the course of a case of conjunctivitis. We ought, therefore, to always expose the membrana nictitans by means of a pair of forceps; evert the membrane and examine it to see if there are any enlarged follicles, or a foreign body present, especially in catarrh of the conjunctival tissue. According to Frohner, 40 per cent. of all dogs are affected more or less by conjunctivitis follicularis.

Purulent Conjunctivitis; Conjunctival Blennorrhœa.

Etiology.—It is generally admitted that this disease is due to a specific infectious organism developed in the course of some epizootic disease, particularly distemper, and a specific form of this disease may occur as an epidemic, the cause of which up to the present time has not been definitely described. It is possible to produce the same form of the affection by inoculating the conjunctiva of a healthy dog with this purulent material. Guilmot observed that by placing dogs in a kennel which had been previously used by a dog affected with this disease that they soon became similarly affected, and it has been found to be carried by the benches where dogs are exhibited. Frohner has seen it in many cases of distemper, and thinks that the development of this form of conjunctivitis is due in all probability to the transmission of gonorrhœal secretion from a human being placed on the conjunctiva of the dog. Guilmot says that gonorrhœal secretion of the dog itself is the cause of this disease, but this assertion is combated by Moller whose experiments with secretions of preputial gonorrhœa in the dog have always given negative results.

This form of conjunctivitis is marked by considerable swelling of the membrane. The membrane is sometimes spotted red by hemorrhages;

there is sensitiveness to light, and photophobia, the animal constantly winking or convulsively closing the eye. The secretion of the eye is changed into a muco-purulent mass, becoming filled with a thick, yellowish-green fluid mixed with pus, which agglutinates the lids, particularly during the night, when the animal is asleep, and there is great itching and irritation causing the animal to rub the eyes continually with his paws, and in this condition complications of the cornea are generally present. The latter becomes dull in the centre, showing erosions in some cases. This capacity of the cornea gradually increases, becoming darker, more opaque, and then taking a yellowish-gray coloration. We may see in some cases, ulceration of the cornea (see Keratitis). A common occurrence is to find eczema of the eyelid and the skin around the eye.

This blennorrhœa of the conjunctiva is a rare and dangerous disease, causing extensive inflammation and ulceration of the cornea, the condition being prolonged in some cases from four to eight weeks, and in extremely bad cases the eye is apt to be destroyed.

Therapeutic Treatment of Conjunctivitis.—If the disease is produced by foreign bodies, an eruption, etc., or caused by trichiasis or entropion, we have to remove the cause first. If we have to deal with dirt, coal dust, or small bodies, it is sufficient to wash out the eye with a little soft-rubber syringe. If the bodies are adherent, such as iron fragments, sand, etc., accompanied by convulsive movements of the lids and intense secretion of tears, we must apply a certain amount 4 per cent. solution of cocaine to the eye, remove the foreign bodies, or wipe them off by means of a blunt probe or sound covered by a handkerchief or cotton. Then keep the animal away from strong light, smoke, etc.

First, foment the eye thoroughly with boracic acid solution, and to thoroughly clean the eye the membrana nictitans must be lifted, as that membrane is pulled down close on the eye as soon as the fomentation is started; the eye must, however, always be cocained previous to doing this, as the membrane is too sensitive to do it otherwise. The cocaine solution can be applied by means of an atomizer.

℞.	Cocaine muriate,	0.25
	Aqua distil,	5.0
Sig.—A few drops in the eye.		

℞.	Acoin,	0.1
	Aqua distil,	10.0
Sig.—A few drops in the eye.		

In **catarrhal conjunctivitis** we must use astringents, such as sulphate of zinc, sulphate of copper, or nitrate of silver. These solutions must be used mild, such as 0.2 to 0.75 per cent. They may be applied by means of a camel's hair pencil or atomizer put between the lids and washed off in a short time with clean water; or we may apply nitrate of silver, following it up a few minutes afterward with a 2 per cent. solution of chloride of sodium. Alum solutions are also useful for washing or painting the inflamed membrane. In pronounced photophobia we may paint the conjunctiva with a solution of cocaine or tincture of opium and gum arabic. In chronic cases apply ointments of calomel, 10 to 20 per cent., oxide of mercury, 3 to 5 per cent. It is not well to keep up too long with one preparation, but substitute another drug after a certain period has elapsed.

In chronic catarrh of the eyes a very effective method of reducing the irritation is to blow small quantities of calomel directly on the membrane. Follicular conjunctivitis may be treated with astringents, but in the acute forms which occur on the surface of the membrana nictitans we can only remove them by surgically removing the membrane.

℞.	Zinc sulphate,	1.0
	Acid boric,	3.0
	Aqua distil.,	150.0

Sig.—Eye drops.

℞.	Argenti nitras,	0.1
	Aqua distil.,	10.0

Sig.—A few drops in the eye for several days.

℞.	Hydrarg. sesquioxide,	1.0
	Ung. petrolati	4.0

M. F. ung.

Sig.—Apply to the edges of the lids twice daily.

The influence of cocaine upon the conjunctiva and cornea renders these parts insensitive and permits a number of small operations without producing any feeling of pain or convulsive irritation of the eyelid. We pour a little 5 per cent. solution of cocaine into the eye and obtain in this manner, in from two to three minutes, an absolute insensibility to pain, both in the cornea and conjunctiva. This does not, as a rule, last more than ten minutes and must therefore be renewed every five minutes if necessary. In order to reduce blepharospasm, as a consequence of conjunctivitis, we should apply solutions of cocaine every two or three hours. In the milder forms of follicular conjunctivitis that is seen on the inner surface of the membrana nictitans, the stronger solutions of sulphate of zinc, sulphate of copper, or nitrate of silver are used. It is best to apply a solution of cocaine to the eye and then lift up the membrana nictitans and apply the solution directly to the inside surface of the membrane by means of a camel's hair brush. These cases are generally very obstinate to treat and it is best, when after some time the condition does not improve, that the membrana nictitans be removed by surgical means (see page 530). This operation invariably removes the irritation.

In **ophthalmic blennorrhœa** we must endeavor to prevent it before it goes too far, particularly if it appears as an epizootic. We must treat it with antiseptic agents, and it is especially important to keep the conjunctiva clean with water or some non-irritating antiseptic fluid, such as boric acid, 3 per cent.; corrosive sublimate, 0.02 per cent.; permanganate of potassium, 0.05 per cent.; creolin, 1 per cent.; salicylic acid, 1 per cent.; carbo-sapo-cresol or lysol, 1 to 100. These must be introduced under the lid by means of a syringe, brush, or sponge. When it is necessary we must irrigate the eye with strong solutions of nitrate of silver (1 to 3 per cent.), taking care to observe the rules already mentioned, that is, neutralizing the silver solution by means of salt solution. A solution of itrol 1 to 4000 has been found very useful in these cases. Covering the conjunctiva with calomel, dermatol, tannoform, is also useful. This is applied by means of an insufflator or blown through a cylinder of paper or a quill. Aniline (pyoktanin), advised by some authors, is of little benefit.

The treatment may also be materially altered by complications of the cornea, for which we would refer to Keratitis for further details.

Neoformations on the Conjunctiva.

Beside the inflammatory condition which has just been described, we may have tumors, fibromas, papillomas and lipomas of the conjunctiva, but, as a rule, these occur on the membrana nictitans. They are generally painless, sometimes extending over the eye and preventing the closure of the eyelids. A peculiar case of hair formation has been observed by the writer, situated in the conjunctiva of the upper lid, in which a tuft of long, white, silk-like hair grew out of it, and a few isolated hairs in the vicinity of the spot. On examination the hair spot was found to contain hair bulbs, sebaceous and sudoriferous glands. It was found that several animals of the same strain in that breed had similar anomalies.

DISEASES OF THE CORNEA.

Inflammation of the Cornea.

(*Keratitis*).

Notwithstanding the fact that the corneal coat does not contain any blood vessels, it is frequently the seat of inflammatory processes which become present through a pericorneal injection due to intense irritation of the blood vessels which surround the border of the cornea, and further by an opacity of the cornea forming an obstruction that prevents the admission of rays of light into the eye itself. This clouding or opacity may extend over the entire cornea, or it may only involve a small portion. It varies in color from a grayish-blue to a pure gray. It is yellowish-gray in some cases (purulent inflammation), but never pure white in color. On careful examination it seems to be diffuse, forming spots or stripes. The lustre of the membrane is dull on its surface and a partial loss of the epithelium is noticed. The other symptoms are avoidance of light, convulsive movements of the eyelids, and discharge of a thin watery mucus from the corner of the eyelids, visual deficiencies, and in some cases the animal may be partially or even totally blind. This is especially seen when the opacity of the sclerotic membrane is in the region of the visual line that is opposite the pupil.

Pathological Anatomy.—We have in other cases of keratitis the appearance of large quantities of round cells in the corneal tissue. These come from the blood vessels of the neighboring membranes, the sclerotic membrane, and the conjunctiva. These are wandering cells which find their way into the cornea. As long as the round cells in the cornea are not crowded together it remains unaltered in its true structure (infiltration of the cornea), and complete recovery follows after the cells have disappeared. But as soon as the cells are packed too closely together the corneal tissue is partially destroyed by maceration and necrosis, followed by a loss of actual substance. If this is surrounded by intact tissue of the cornea, it forms an abscess; if it is open externally, it forms an ulcer. We consider as ulcers, small superficial openings in the cornea which are always round in the early stages, and are caused by infiltrations located closely under the epithelium, forming little blisters or sacs, and finally bursting through the epithelial covering. In the dog, as a rule, they heal without leaving any cicatrix. Still, many cases are seen where they finally close up, leaving a white cicatrix, or else they lead to perforation of the cornea or to a total destruction of the eye by extending into the anterior chamber.

We find the following forms of inflammation of the cornea:

(1) **Keratitis Superficialis.—Etiology.**—Superficial inflammation of the sclerotic membrane is caused by slight irritations of various kinds (superficial injuries, inversion of the eye-lashes (trichiasis) or entropion). It may also originate, secondarily, from acute conjunctivitis, the inflammation extending from the conjunctiva to the cornea, irritating eye washes or salves, or from foreign bodies. Keratitis superficialis may also appear as a secondary symptom of distemper, but generally in this case the entire parenchyma is involved.

The cornea is clouded, opaque and lustreless, having a diffuse grayish-blue or grayish-white coloration, with a slightly irregular surface, but under certain circumstances it may also be covered with small epithelial masses, easily distinguished with the naked eye. In this affection the eyes are watery, which may disappear in a few days or last for weeks. In the latter case we observe the formation of blood vessels at the border of the cornea and the sclerotic membrane. These blood vessels increase in size and the edges become very vascular, and during vascularization of the cornea it is not rare to see hemorrhages in that tissue followed by a number of brownish-black pigment spots, and occasionally the cornea remains permanently opaque and even vascular. Froehner describes a superficial purulent affection of the cornea as an effect of purulent keratitis or as a secondary symptom of distemper; this is indicated by a roughened appearance of the cornea, and a yellowish opacity of the cornea due to pus corpuscles.

Therapeutics.—The treatment is the same as in inflammation of the conjunctiva—that is, washing and painting with a solution of sulphate of zinc, corrosive sublimate, alum, or sulphate of copper, boracic acid, or the oxide of mercury salve; where there is great pain and photophobia use solutions of cocaine or acoin. Avoid all use of lead solutions in such cases where there is any loss of substance of the cornea, as the lead is deposited in the ulcer and produces black-colored spots which are permanent. If there is any ulceration, we must apply the therapeutic treatment as indicated in ulcerative keratitis, and in cases where the spots on the cornea remain use the treatment given under the same heading.

Peritomy.—This operation is recommended in **pannus,** that condition where there is vascularization of the cornea, and after massage, stimulating salves and hot-water compresses have been tried and failed. The animal must have a few drops of a 4 per cent. solution of cocaine put into the eye, and the lids held back by an assistant; then the affected surface of the cornea is carefully scarified, or curetted by means of the edge of a sharp knife. Great care must be taken to hold the knife at right angles to the eye, as the slightest slip or struggle on the part of the animal misplacing the position of the knife will cut through the cornea. The surface must be carefully scraped until all of the vessels are removed from the surface of the cornea. Frick recommended making a direct incision in the cornea. He fixes the eye and by means of a very sharp knife, pares off the abnormal formation, even cutting down half through the body of the cornea, treats it with boric acid solution, and generally has a cure in a few days.

(2) **Keratitis Profunda or Keratitis Parenchymatosa. Deep Parenchymatous Inflammation of the Cornea.**—This affection may be circumscribed or diffuse. In the former it is due to some external traumatism directly on the corneal membrane; in the latter, the diffuse condition is due to some infectious disease such as distemper, or, in certain cases, fever is the only other symptom present. The surface of the cornea has an opaque, dull, slightly grooved condition, the color bluish-gray

or gray, rarely grayish-white, either covering the entire cornea or only certain portions, accompanied by watery eyes, sensitiveness to light (but only to a slight degree), and also the formation of new vessels which extend from the borders of the cornea toward the centre. In the keratitis of distemper the opacity covers the entire eye, and is blue-gray or even milky in color. Abscesses and ulcerations, as a rule, are rare. This form, however, must not be mistaken for ulcerative keratitis. In mild cases the opacity may disappear without leaving any trace; in more severe cases it may run a protracted course, with vascular infiltration from the border of the cornea. These cases are very difficult to treat, running on sometimes for months and at times resist all forms of treatment, in some cases terminating in ulceration (see Keratitis).

The course of this disease is generally favorable. After several weeks the dulness disappears and the new vessels become thinner, disappearing entirely in a short time.

Therapeutics.—We attempt to remove the irritation to a certain extent by applications of compresses. Also irrigate with warm water or boric acid, and drop atropia into the eyes. Bandages over the eyes. If the inflammatory symptoms are reduced, we then follow it up by stimulant irritants, such as calomel powder or ointments of red oxide of mercury. As to massage of the cornea and treatment of ulceration see Keratitis.

(3) **Abscesses of the Cornea.—Etiology.**—Abscesses of the cornea appear after some traumatism, especially contusions or bruises of the membrane, also after non-septic operations, in connection with blennorrhœa or conjunctivitis, or during distemper, and very frequently appear without any appreciable cause, which some ascribe to lymphatic infection.

When there is intense dread of light and great increase of tears, and when we see a pericorneal injection and the cornea colored a gray, yellow, or straw-yellow, and a certain spot on that part which is sharply defined from the tissue of the normal cornea, or it is surrounded by a more or less dull zone, we then can safely conclude that it is the commencing formation of an abscess. Its location varies; sometimes it is on the edge of the cornea, at other times in its centre; then, again, we may find it close to the surface of the membrane or deep in the centre of it. It may be very small in dimension, such as the size of a pin-head, or it may even include the whole sclerotic membrane.

The course varies also. In small abscesses it may disappear by simple absorption, while in large ones the acute inflammation subsides, frequently leaving an intensely white spot, or it may break out externally, forming an open ulcer. This latter conclusion, or termination, is the most common, and in rare instances it may break in a posterior direction toward the anterior chamber of the eye, causing an accumulation of pus in it (hypopyon) and producing further inflammatory processes in the internal part of the eyeball.

Therapeutics.—This is closely related to that of ulcerations of the cornea—that is, to open, puncture, or cauterize the abscess after first using cocaine in the cornea. It is then dried with corrosive sublimate or iodoform gauze and washed out with a solution of corrosive sublimate, and afterwards dusted with calomel until it dries up; in certain cases touching the edges with the actual cautery seems to bring about prompter resolution.

(4) **Ulceration of the Cornea.—Ulcus Corneæ.**—This results from traumatisms, irritations, and an accompaniment of distemper; it also appears in diabetes mellitus and certain breeds, such as toy spaniels and Boston terriers, seem to be prone to it, with no appreciable cause; apparently it is due to a certain cachexia and after maceration or necrosis of the corneal epithelium, as a consequence of blennorrhœa of the cornea. In this condition we find a loss of substance in the cornea which varies in size and depth, showing a grayish-white or grayish-yellow ground, and, as a rule, has short, abrupt borders with a bluish-gray, gray, or grayish-yellow opacity in the immediate neighborhood of the ulceration and accompanied by great dread of light; the eyelids are practically closed and the membrana nictitans drawn over the eye. When the ulceration of the cornea begins to heal it is indicated by a lessening of the infiltration in the immediate neighborhood of the ulcer, the dull circle surrounding it becomes clearer, the pericorneal injection less, and the dread of light begins to disappear. In rare instances blood vessels will shoot from the edge of the cornea toward the ulcer, and the cornea in appearance very much resembles the normal tissue of the sclerotic membrane. If the ulceration has not been very deep, the dulness gradually disappears, leaving only a very thin white veil of opacity; or, if the ulceration is deep, we have as a result a distinct white spot which remains permanently (cicatrix of the sclerotic membrane, macula cornea). This cicatrix of the membrane may become clearer in the course of time, but, as a rule, it never disappears entirely. When the ulcer does not take a favorable termination we find the inflammation increases, the ulceration becomes deeper, reaches the membrane of Descemet, and we have a perforation of the membrane in a few days. The contents of the anterior chamber escape through the opening, and in rare instances the iris and the lens push forward and may also protrude if the opening is large enough. After perforation occurs the ulcer begins to heal, and we are very apt to have an adhesion of the iris and lens to the posterior wall of the corneal membrane, the pupil is drawn to the edge of the cicatrix and the sight greatly impaired. In other cases where the opening

of the ulcer is very small the anterior chamber fills up again, is forced forward, forming a clear bladder-like body, forming corneal prolapse or dropsy of the cornea (keratocele). If the ulcer is large, the membrane of Descemet pushes through the ulcer from internal pressure and the whole ground of the ulcer becomes embossed—that is, it stands out from the surrounding membrane. As a consequence of perforation of the cornea we may have a series of alterations to the iris. Externally the iris, which is drawn into the orifice, becomes covered with cicatricial tissue, and by its contraction forms a lobule of the iris. This finally contracts into a peculiar club-shaped body over the anterior surface of the membrane (iris staphyloma). We must not confound this condition with staphyloma pellucidum, by which we mean a change of form in the corneal membrane, due to a non-inflammatory condition, where it becomes more or less opaque and is forced outward in the shape of a grape-like body by the dropsical condition of the anterior chamber. When there is great irritation of the corneal membrane, in some cases we may have a prolapsus of the lens, and the whole eyeball subsequently collapses, forming an opening in the centre of the eye which finally becomes closed up by a whitish-gray cicatrix.

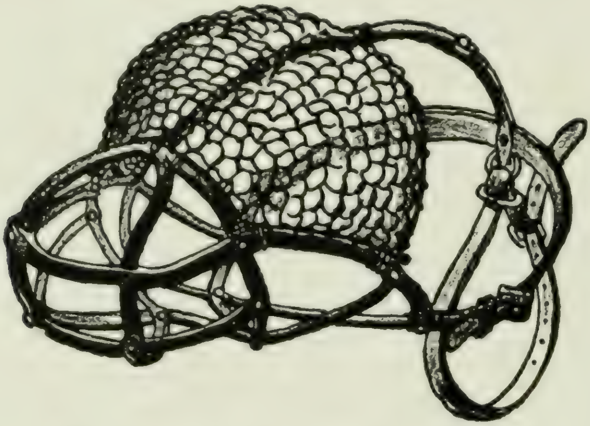


FIG. 190.—Muzzle with eye protector.

Besides the causes already mentioned in the formation of abscesses, the following also produce them: cauterization, foreign bodies which adhere to the membrane, wounds in some cases, etc. This disease may appear in the epizootic form with or without distemper, and generally in connection with blennorrhœa of the whole eyeball (purulent panophthalmitis).

Prognosis and Therapeutic Treatment.—The prognosis depends to a large extent on the location of the ulcer and the rapidity of its progress.

Ulcers which are small and located on the borders are easier to treat than those which are larger and located in the centre of the cornea. In weak, badly fed young animals and in pugs the prognosis is more unfavorable than in healthy adult animals.

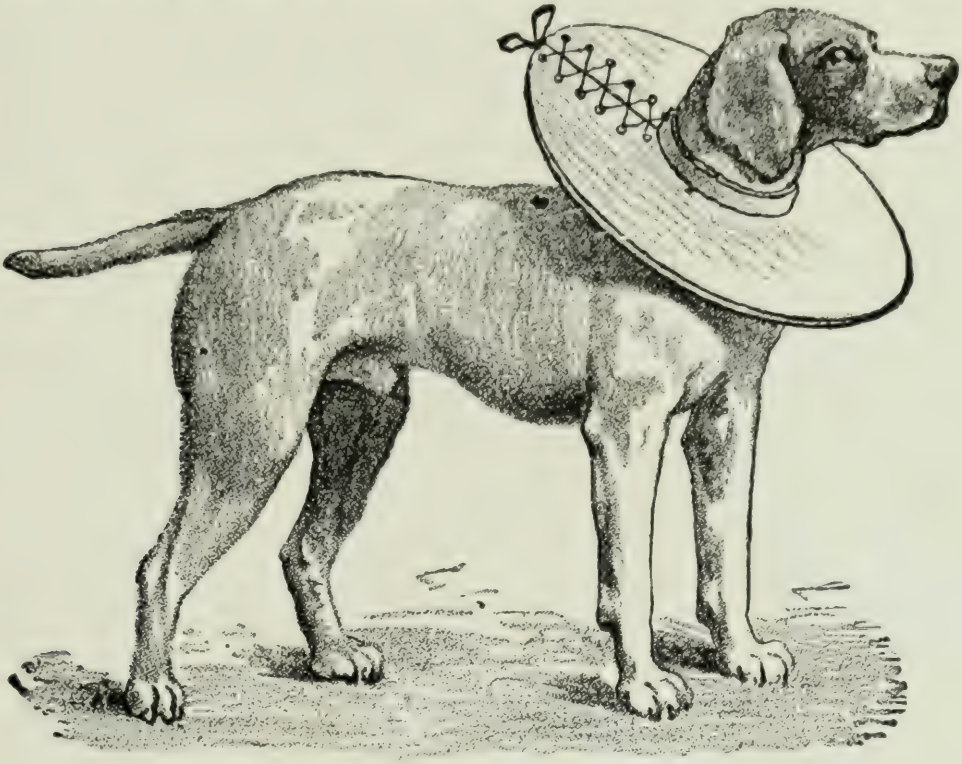


FIG. 191.—Neck collar.

The treatment requires cleanliness and strict antiseptic remedies. The use of a dressing is of great advantage, but few dogs can be made to submit to one. In canine hospitals, as a rule, they use a specially constructed leather cap; it is not to be used except in extreme cases, where it is impossible to keep the animal from scratching or rubbing the eye. It is always well to leave the affected eye without covering, as all bandages or coverings are apt to press on the eye and cause intense pain, which irritation the animal generally increases by rubbing or pulling

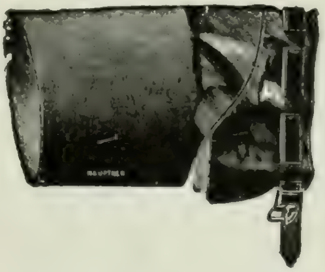


FIG. 192.—Cap for eye protection.

constantly at the covering. The various antiseptic agents which are used are corrosive sublimate, 1 to 2000, or chlorine water (either pure or mixed with two or three parts of water), to be applied with a brush and calomel powder blown from a quill directly on the eye. The writer has obtained very satisfactory results with hot fomentations of boric acid (3 parts to 100). These should be applied three times daily, ten minutes at a time. They are far better than cauterizations with nitrate of silver or painting with pyoktanin.

Besides the antiseptic treatment we can use atropine or eserine solution, of which a few drops are put in the eye. The first-named agent should be applied when the ulcer is located centrally, as it dilates the iris, and consequently the pupil is enlarged, and the latter when the ulceration is located on the borders as it contracts the pupil and draws it away from the seat of irritation. There is an objection to atropine in that it increases the internal pressure by widely dilating the pupil. The iris is dilated or contracted by these drugs and removed from the neighborhood of the ulcer, so that if the perforation does not occur the iris will be drawn far enough out of the road to prevent any adhesion.

Good results have been obtained with cocaine, alternating with atropine:

℞.	Atropine sulphate,	0.1
	Aqua distil.,	10.0

M. S. In order to produce a dilatation of the pupil we must introduce five drops of this remedy into the conjunctiva, drop by drop, by means of a brush or a dropper.

℞.	Eserine salicylate,	0.05
	Aqua distil.,	10.0

When a keratocele is developed we may prevent rupture by puncturing the membrane with a needle and allowing the water in the chamber to escape. In prolapsus and adhesion of the iris we can do very little, as it is impossible to push back the iris into place. We must dust the protruded portion with calomel; at the same time we may reduce the enlargement by means of nitrate of silver or sulphate of copper solutions, or a powder of oxide of mercury blown on the eyeball. In iris staphyloma, where the tissue does not wedge and contain a portion of the contents of the anterior chamber, the eye may be cocained and by means of a very sharp pair of scissors the staphyloma may be carefully cut down; if, however, the protruded portion is filled with the fluid portion of the anterior chamber, a threaded needle is carried through the centre of the protruded portion and the thread cut at the needle and thus making two ligatures which are tied right and left dividing the enlargement into two portions, the ligated portion of the cornea will dry and pull off in a few days with the ligatures, leaving a surface which dries up very quickly with the ordinary antiseptic treatment.

We must try to remove any spots on the sclerotic membrane by means of irritants, such as the mild chloride or oxide of mercury or massage. According to Bayer, massage of the cornea has to be performed in the following manner: The points of the fingers are placed on the closed-up eyelids and by a constant circular or centrifugal friction move the eyelid for sometime. In some cases we may also apply the above-mentioned ointments and powders. The writer has obtained far the best results from calomel than anything else. He placed daily a small amount of powder composed of equal parts of calomel and sugar (grape sugar) on the cornea and massaged the eyelid for ten minutes. Very good results by painting the enlargement several times daily with a solution of pyoktanin (1 to 100).

In regard to the use of powders in the treatment of ulcers of the cornea and other diseases of the eye it is of the greatest importance that such powders be of the finest possible texture. Coarse powders irritate and are liable to give results just the opposite of those expected. The same caution applies to ointments that contain substances that are insoluble in water. For this reason **calomel,** when used, should invariably be in the form of **hydrargyrum chloratum vapore paratum.** Oxide of mercury should be in the form of **hydrargyrum oxydatum flavum** or **hydrargyrum oxidatum via humida paratum. Oxide of zinc,** to avoid having dispensed **zincum oxydatum crudum** should be prescribed as **zincum oxydatum purum. Iodoform** should be prescribed as **iodoformium subt. pulveratum.** New remedies in the form of a powder should always be tested in regard to local irritant effect and physical fineness of the powder. If such powders, when rubbed between thumb and forefinger, feel harsh or perhaps even gritty they should not be used, no matter by whom recommended!

Results obtained by the author by the use of pyoktanin (pencil or watery solution, 1 to 100) were far more satisfactory. The use of auramin indicated that this remedy was too weak.

The following alterations are also seen in the cornea of the dog:

Dermoid of the Cornea.—This condition has already been described under neoformation of the cornea. It is the most common neoformation of the cornea of the dog. We find a peculiar abnormal collection of true epidermal tissue on the cornea which is covered with hair and interferes with the direct action of light, and also produces irritation in the cornea and conjunctiva (Fig. 192). The hair should be cut off by means of scissors. Thierry observed the same abnormality on the sclerotic membrane of both eyes in a three months' old dog. There was a slight swelling and enlargement above the surface of the membrane which was covered with fine hair.

The treatment consists in the removal of the abnormality, the eye is cocained, the dermoid is lifted with a pair of fine curved forceps and removed by means of a pair of curved scissors. An opacity of the cornea follows as a result; no attempt should be made to remove this for at least two months, as any friction or manipulation shortly after the operation is apt to set up great irritation. In removing the dermoid great care must be exercised not to cut entirely through the cornea and allow the escape of the contents of the anterior chamber; if any part of the dermoid seems to involve the deep structure of the cornea, it had better be left alone. French advises that during the operation a stream of warm water should run over the eye to carry off the blood and facilitate the operation.

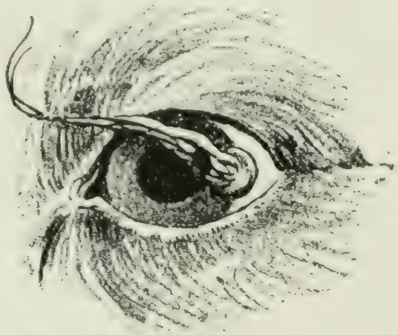


FIG. 192.—Dermoid of cornea.

Pterygium.—By this we mean a more or less triangular proliferation of the connective tissues containing numerous blood vessels and branching over the cornea toward the centre. This growth is very loosely connected with the corneal structure and can be removed by means of caustics or by an operation; the animal is narcotized or the eye cocained, the growth seized by means of a pair of curved forceps, raised from the surface of the globe, and carefully dissected out, and the hemorrhage controlled by astringents.

Injuries to the Cornea.—It is not uncommon to observe injuries to the cornea of dogs where the epithelium is slightly injuried or where there is a deep penetration of the membrane or it is entirely perforated, such as injuries from cats' claws or sticks mischievously pushed into the eye or from the lash of a whip. Immediately after the injury we observe a great fear of light, closing of the eye, and copious tears. Wounds which have not entirely perforated the cornea are rapidly followed by an opacity and swelling in the neighborhood of the injury. When the membrane is perforated the symptoms and results are very similar to ulceration. Superficial or very small wounds which penetrate deeply heal very quickly after a few days, leaving scarcely any opacity. This, of course, must be expected in wounds that have been caused by some object that was clean, while septic large wounds, caused by some unclean object, frequently produce great irritation, and penetrating ulceration results, ending in panophthalmia and destruction of the eye.

The therapeutic treatment of wounds of the cornea is identical with that of corneal ulceration.

Desiccative Keratitis. Xerosis Corneæ.—This is a particularly rare condition described by Bayer that occurs as a result of acute distemper; it is seen particularly in pugs, and in all conditions that prevent normal closing of the eyes. The animal has a wide open staring look of the eye, the cornea is dull and lustreless, there being no reflection in it; the conjunctiva is tumefied, corrugated and deep purple-red in color and covered with a thick tenacious secretion. After a short time the cornea commences to slough small portions of its substance, and it finally becomes reddish-brown in color. The treatment consists in moist fomentations and compresses of boracic acid solution, followed by astringents such as acetate of lead or sulphate of zinc solutions. If the acute symptoms of distemper have not shown themselves they are apt to appear shortly after this condition is developed.

Corneal Spots or Opacities. Maculæ Corneæ. Leucoma.—By this is meant more or less turbidity or opacity of the cornea, due to injuries, ulcerative keratitis and certain opacities that are not accompanied by fever or other phenomena. These spots may vary from complete opacity of the cornea to cloud-like spots, dull white, chalky white, or pigmented (Fig. 193). Calomel blown on the cornea by means of a small cylinder of paper or a quill, salves, such as calomel 1 part and petroleum salve 4 parts; a piece the size of a pea is put on the cornea and the lid gently massaged for several minutes. Calomel and sugar of milk, equal parts, is also used; a small portion is put on the eye by means of a camel's hair pencil, and the lid is gently massaged, moving the lid by a circular motion of the finger for ten or fifteen minutes. Red and yellow precipitate of mercury ointment or a few drops of iodide of potassium, 3 per cent. solution, are sometimes found useful as an absorbent. Also eye waters of potash 1-2%, am. chloride 5%, painting with tinc. opii or dionin sol. 2%, subconjunctival injections of iodini chlorid sol. 3-10%, etc. When there are elevations or encrustations on the cornea due to the deposit of chemicals from eye washes, they can be curetted (scraped) off by means of a sharp knife. The cornea is, as a result of this irritation, apt to be slightly denser in its structure. Certain permanent opacities of the cornea that disfigure the animal can be modified by means of tattooing; the eye is cocained and a tattooing needle used. The punctures are made in an oblique direction to avoid any possibility of puncturing the cornea; a great number of small punctures are made in the body of the opacity, covering its entire surface, and sepia or india ink rubbed into punctures. This is done by putting the color in solution on the eye and massaging the lid for ten or fifteen minutes at a time. This tattooing may have to be repeated several times.

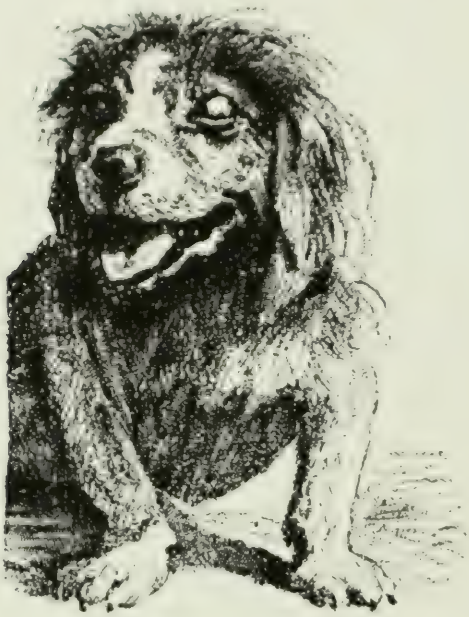


FIG. 193.—Leucoma.

DISEASES OF THE CRYSTALLINE LENS.

Cataract.

All diseases of the lens, either of its membranes or its capsule, as a rule cause a certain amount of opacity, and may form one or more star-like gray bodies in the centre of the lens itself (cataract). It is not possible to enter into a description of the various forms of cataract and its pathological alterations, but we will only take up one form (gray) of cataract that can be subdivided into two forms—soft, which may be congenital; or traumatic and hard or contracted cataract, which is senile. The softening process generally begins in the equator of the lens, and becoming diffused soon causes a total opacity of light gray color. This may be streaked with darker lines or it may have a mother-of-pearl discoloration, with enlargement or distortion of the lens in a forward direction and a contraction of the anterior chamber. This is very often seen in young animals. The contracting process, on the contrary, begins in the shape of a number of small whitish striæ, or dull opacities, in the peripheric layers of the lenticular nucleus, and extend gradually over the cortical, giving the lens a yellowish-white or yellow aspect after some time. This is generally observed in old dogs (hard nuclear cataract, senile cataract). The so-called capsular cataract does not, as a rule, depend on true opacity of the capsule, but on an accumulation of products of the same, which have been developed from disease processes which have gone on in its immediate neighborhood. For instance, the inflammation of the iris. In some cases they appear in small, star-like or streaked pigmented dull spots, which are distinctly marked.

Etiology.—Gray cataract, as a rule, is a senile or old-age affection, but it is not rare in young dogs; in this case the opacity is deep-seated, and brilliantly white star-like opacities appear in the posterior part of the lens, and now and then it is congenital. The writer saw one case of hereditary star cataract in connection with microphthalmus. Meleval observed in the progeny of a pair of poodles, where the dog had a double cataract, that the pups had lenticular opacities. The development of cataract which occurs in advanced age—that is to say, after ten or twelve years—is what is known as senile cataract; this is slow in its development, while cases of opacity of the lens, which are observed in young animals, appear frequently without any marked cause, and run their course very rapidly, the opacity forming in a few weeks, and even in a few days the whole lens has been completely covered. Traces of sugar are found in the urine of dogs which become very thin and anæmic in a short time, cataract frequently developing in this condition. Frohner thinks that the lens becomes saturated with grape-sugar, which is present in diabetes, and the lens undergoes a retrogressive metamorphosis due to disturbance of its nutrition.

There is no doubt that cataract is also caused by inflammatory processes of the eye, and the nutritive supply of the lens becomes disturbed and its normal condition impaired, such as ulcerations of the cornea with central perforation, inflammation of the membrane of the lens and iris, and also bleeding into the anterior chamber. Injuries of the lens and concussions of the eye also cause a number of cases of cataract.

Certain conditions are developed as the result of concussion of the eye and appear quite frequently; they may be thus briefly described: The lens either sinks downward with the capsule or becomes laterally displaced. It may lean against the iris or it may drop forward into the anterior chamber of the eye, and it may finally crowd into the vitreous humor. If the lens has undergone but slight displacement (subluxation), it may remain clear for some time, but the vision is much impaired. If it has fallen into the anterior chamber or has been forced into the vitreous humor, we see a rapid development of the cataract, and in the later stages considerable inflammation of the choroid membrane of the iris, or of the whole eyeball.

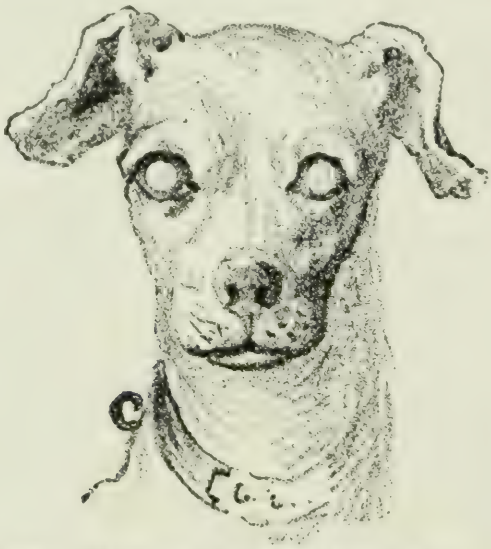


FIG. 194.—Gray cataract of both eyes.

Clinical Symptoms.—In cases where the disease is somewhat advanced, and the cataract is fully developed into one of the following forms—punctiform, streaked, spotted, or complete opacity of a whitish-blue, brownish-blue, or mother-of-pearl color—it is easily recognized (Fig. 194); but, on the other hand, where there is a mere cloudy dimness and small spots of cataract, we must use candle-light or some illuminating power such as an ophthalmoscope and a strong light to see the action of the lens in the eye itself. Before doing so, however, we must dilate the pupil with atropia.

Discoloration of the lens may be caused by violent concussion, contusion of the eyeball, and by various pathological conditions in the interior of the eye. It may be congenital, the lens being in a variety of positions in the eye, sometimes it is necessary to dilate the pupil by means of atropine to ascertain the exact position of the lens.

The prognosis is rather difficult to make, and, as a rule, it should be an unfavorable one. Hereditary cataract shows little inclination to enlargement, as is also the case in senile cataract. In soft cortical cataracts seen in young animals, we may see a rapid opacity of the lens in a few days or weeks. The sight is entirely lost and medical treatment is of little use.

Therapeutic Treatment.—In the early stages of senile cataract very good results have been obtained with iodide of potassium, 2.5% solution, few drops in the eye daily, or 1% subconjunctival injections. A gray cataract may be removed by an operation, and this is much more advisable in the dog because it is, as a rule, particularly in young dogs, attended with no great danger, and its results are generally beneficial, producing a partial restoration of the vision. It is advisable to perform the operation of cataract after having first dilated the pupil by means of atropia, and then performing the operation under ether. The writer has tried cocaine alone, but he finds it unsatisfactory. The animal must be tied up, placed on a table, and ether or chloroform administered. The operation is performed by one of the following methods:

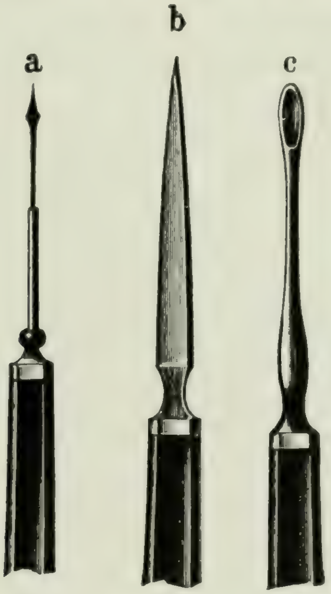


FIG. 195.—*a*, Stop discission needle; *b*, Graefe's cataract knife; *c*, Daviel's cataract spoon.

Opening of the Capsule.—The anterior capsule of the lens has to be opened in a transverse way with what is known as a discission needle

(Fig. 196, *a*). The fluid in the anterior chamber causes a gradual breaking up and reabsorption of the lens. An assistant holds the eyelids open and the operator seizes a fold of the conjunctiva with a small tenaculum, holding the eye firmly with the left hand, while holding the needle in the right hand, placed on the animal's head to steady it. The needle is then introduced into the cornea, in the middle of the lower external quadrant, in such a direction as to meet the ciliary insertion of the iris and as far as the upper internal quadrant. Before the point of the needle has reached this latter point, however, it is placed firmly on the capsule of the lens, and this is cut through in a transverse direction with a lever-like movement of the needle (Fig. 196, *b*). The instrument must then be removed in the same way that it was introduced in perforating the cornea. After the operation the animal must be placed for some time in a dark place and the eye treated twice a day with atropine. We must treat all irritating symptoms of the eye by means of cold compresses, and sometimes we must use mild laxatives. After six or eight weeks the reabsorption of the lens is complete. We generally perform discission in young animals affected with soft cataract. The result of this operation, however, is not always satisfactory, as reabsorption is slow and in many cases requires a second operation. Several months may also elapse before the cataract is absorbed. Schlampp advises in such cases puncturing the cornea, and by this means slowly allowing the fluid of the anterior chamber to escape, leaving the lens untouched. Anterior displacement of the lens enlarges or ruptures the opening which has been made in the capsule. Reabsorption follows, as a rule, more quickly when this is performed, probably due to the fact that the fluid which contains the elements of the lens has been discharged and replaced by fresh fluid. The process is not dangerous, and may be repeated much oftener than discission.

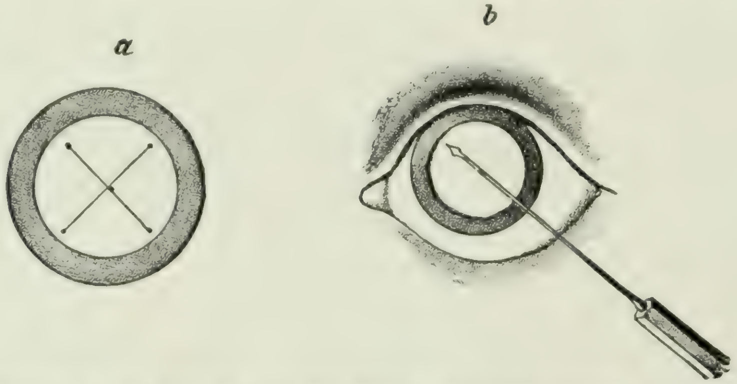


FIG. 196.—Discission of the lens: *a*, Form and size of the cross-incisions; *b*, method of insertion of the needle.

Linear Extraction.—This operation is used where there is complete opacity of the lens and enlargement of the lens and contraction of the anterior chamber. After having prepared the dog as in the operation for discission, an assistant holding the eyelids apart, with another forceps seize the conjunctiva of the eyeball in the neighborhood of the median line of the eyeball, at the same time everting the upper eyelid. We then make an incision by means of Graefe's cataract knife (Fig. 195, *b*), about 5 mm. broad, through the cornea, about 2 or 3 mm. from the border of the sclerotic membrane. We then pass a discission needle through the wound, split open the lenticular capsule, as in discission, and empty the soft parts of the cataract by means of Daviel's spoon (Fig. 195, *c*). Any remnants of the cut capsule which may not be removed at the time are left to be reabsorbed. If during the operation we observe prolapsus of the iris, we must try to restore it to its position by means of Daviel's spoon (Fig. 195, *c*). If this is not possible, we may cut it off close to the wound of the cornea.

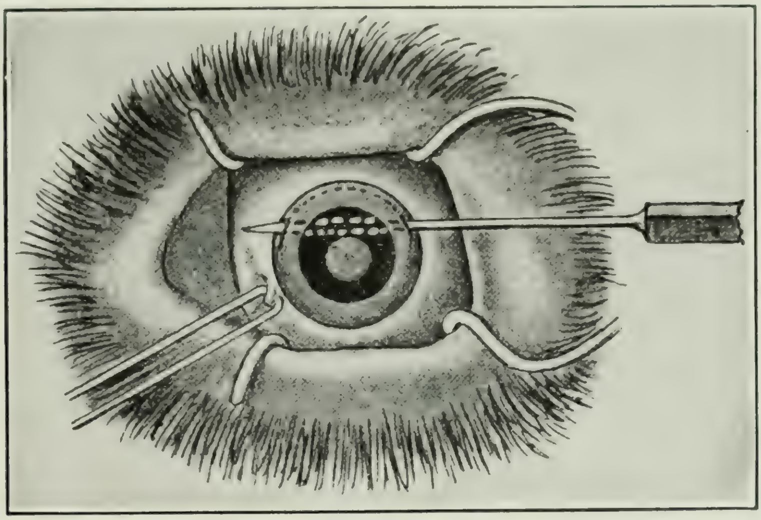


FIG. 197.—Lobular extraction of lens. (*Cadiot* and *Breton*.)

It is very evident that linear extraction is only to be performed in cases of complete softening of the lens. This may be recognized by total opacity of the lens and alteration of the iris, and also when the anterior capsule is pushed toward the cornea.

Lobular Extraction.—Lobular extraction is indicated in hard cataract, which is generally senile, where the lens may be prolapsed into the anterior chamber and where discission will only produce an imperfect result—that is to say, where reabsorption of the lens does not progress properly. It is performed in the following manner:

Make an incision into the cornea exactly as in linear extraction, by means of Graefe's cataract knife, but it must be enlarged to 8 or 10 mm. (Fig. 197). After that the capsule of the lens is split by the discission needle, the fluid of the anterior chamber is allowed to escape, and at the same time the lens must be detached by means of an even, but not too energetic, pressure upon the other side of the eye from the wound, and then by means of the Daviel's spoon the lens is pushed out of the opening (Fig. 198). The subsequent treatment is the same as in linear extraction.

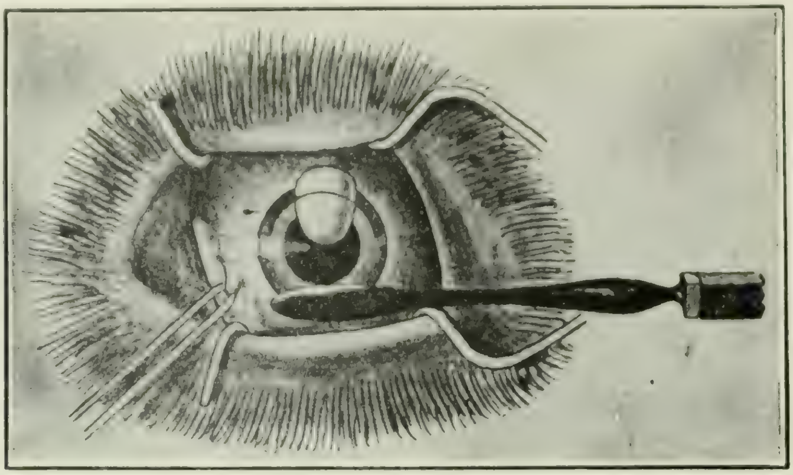


FIG. 198.—Lobular extraction of lens. (*Cadiot* and *Breton.*)

Dislocation of the Lens.—This operation is undertaken in hard cataract, and is performed in the following manner:

By means of a cataract needle pushed through the sclerotic membrane, or the cornea, steady pressure was made on the upper part of the lens, and it was pushed down into the lower posterior part of the vitreous chamber of the eye. The needle is held like a penholder and is introduced into the sclerotic membrane at the side of the eye about 2 to 4 mm.

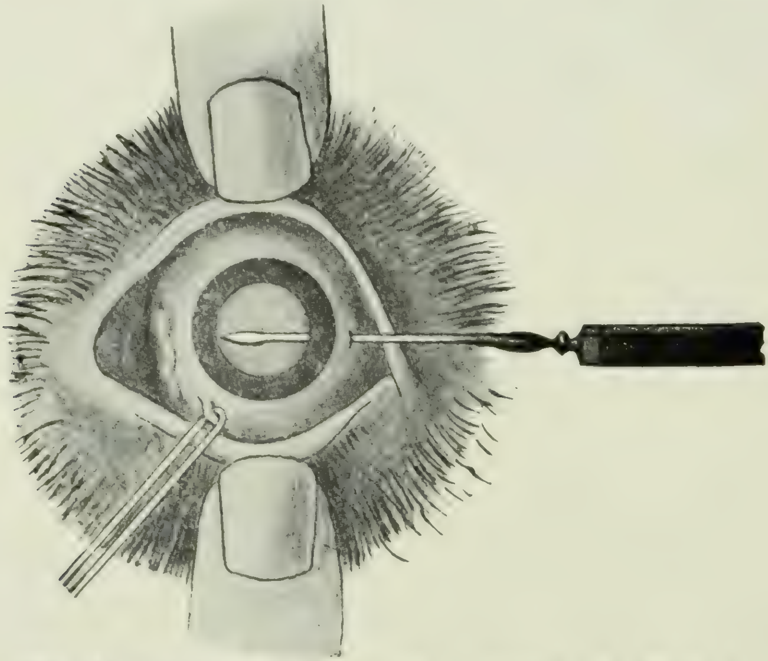


FIG. 199.—Dislocation of the lens. (*Cadiot* and *Breton.*)

distant from the corneal border and is pushed underneath the iris, between it and the lens to the median line, until it is visible in the pupil. When the needle has reached the inner or nasal border of the pupil, the needle is pushed back against the lens and by steady pressure the lens is dislocated from its supports and pushed backwards into the vitreous humor. The lens must be held in position to endeavor to prevent its return. but it is very apt at times to partially re-enter the pupillary opening. It should here be remarked that occasionally absence of the lens may be congenital (Aphacia).

DISEASES OF THE SCLEROTIC MEMBRANE, OF THE NERVOUS PORTION OF THE EYE AND ALSO OF THE VITREOUS HUMOR.

DISEASES OF THE UVEAL TRACT, RETINA AND VITREOUS HUMOR.

Anatomical.

The **Uveal Tract** includes the **Iris,** the **Ciliary Body** and the **Choroid;** the **Retina** includes the point of entrance of the **Optic Nerve** (the papilla). The papilla, retina and choroid (choroid membrane or choroid coat) form the background of the interior of the eye. These organs as well as the vitreous humor which latter (in a state of health) is clear and transparent, can be satisfactorily examined only with the aid of the ophthalmoscope. The ciliary body, which is situated between the iris and choroid, can not be seen even with the aid of the ophthalmoscope. Diagnosis of diseases of the ciliary body must therefore be based upon indirect symptoms.

The Iris.—The color of the iris is brown to yellowish brown, occasionally clear yellow, sometimes blue, frequently varying in the two eyes. Not infrequently the iris may be peculiarly bi-colored (heterochromia), the ground color being brown interrupted with white or light blue spots (birch eye). This is often seen in Bull Dogs, Dalmatians, Coach Dogs, and in Boxern. This is the transition stage of so-called wall eye or glass eye, the eye appears white or yellowish white and upon ophthalmoscopic examination the background of the eye (the choroid) usually shows more or less extensive absence of pigment (see choroid). On the other hand, dogs are occasionally observed with dark spots in the iris and sometimes with a black inner border of the iris which latter condition interferes with correct observation of pupillary action. The pupil of the dog's eye is circular in outline.

The Choroid.—The choroid is densely pigmented. The inner surface contains a triangular area (the tapetum chorioideae or tapetum lucidum), of metallic lustre, often golden yellow with emerald green periphery or, in other cases, more bluish or reddish yellow, whitish toward the border and then again it may be composed of various sized, and vari-colored, irregular patches. This area begins at or slightly above the papilla but the location may vary in that it may be located completely in the upper external quadrant of the background of the eye so that the vessels of the choroid are readily recognized as coursing toward the nasal angle of the eye. The ease with which the vessels of the choroid and retina may be seen and studied depends upon the degree of development (the thickness) of the tapetum and the amount of pigment in those portions of the choroid not occupied by the tapetum. The albinotic eye (with red pupil) offers the best conditions for the minute study of the blood vessels of the retina and choroid. The borderline between the tapetum and the strongly pigmented portion of the choroid, as already mentioned, is by no means distinctly defined; quite frequently the tapetum lucidum itself contains dark, sharply outlined spots, especially in the region near the papilla.

The Papilla.—The optic papilla is located in the lower external quadrant of the background of the eye, 0.0 to 4.0 mm. outwardly from the vertical—and 2 to 3 mm. ventrally from the horizontal—meridian. In form it is usually that of an equilateral triangle with rounded angles and slightly depressed centrally. It may, however, be oval or round under normal conditions. Its color is yellowish, grayish red, bluish or quite dark. Three or four arteries with a peripheral course and the same number of veins originate in a zone occupying the middle third of the distance from the center to the circumference of the papillary area. They rarely originate nearer to the center. The arteries are easily distinguished from the veins by their brighter red color, smaller diameter and more direct course. The large veins not infrequently form a ring-like anastomosis in the area of the papilla in which **arhythmic** pulsation may be observed. The retina, as such, cannot, under normal conditions, be recognized with the ophthalmoscope.

Anomalies of the Iris.—Of this organ there are three kinds of anomalies of interest: Persistent papillary membrane, iris coloboma, and total absence of iris.

Persistent Papillary Membrane (Membrana Papillaris Perseverans).—The fœtal papillary membrane extends in the shape of threads or strings from the anterior surface of the iris to the capsule or over the pupil, or their free ends may also float in the aqueous humor. Calvé saw a young dog, twelve months old, affected like this and saw a similar condition in the mother, and several of her offspring were blind from persistent papillary membrane. Moeller has seen a number of young dogs affected in the same manner.

Iris Coloboma.—This is a congenital split or division of the iris, which is not at all rare. In the iris are found circular split-like openings and there appear to be two and sometimes three pupils (Fig. 200). There are also associated with this condition alterations in the ciliary body of the choroid membrane.

Absence of Iris.—This may be partial or complete, in the former case it is referred to as **irideremia,** in the latter as **aniridia.** Our attention is attracted to this condition by the excessively large pupil which is usually associated with other defects of development.

Inflammation of the Choroid.—This condition is very similar to iritis, and the symptoms are similar. Treatment consists in keeping the animal in a dark place and solutions of cocaine to the eye.

Inflammation of the Iris (*Iritis*).—This affection is very rare in the dog and is apt to be associated with keratitis, cyclitis, or choroiditis. It may also be due to extension of inflammatory processes and to traumatisms, and is also said to be associated with rheumatoid conditions and distemper. It may be recognized by contraction and difficulty of movement or rigidity of the iris, lighter color of the iris, fibrous accumulations in the shape of a gray veil-like coating, and dulness of the fluid of the anterior chamber, and slight dimness of the cornea. There may also be punctiform hemorrhages. The episcleral vessels may be distended, there is pain upon pressure, photophobia, lachrymation and occasionally more or less turbidity of the cornea, especially in the peripheral border. The cure for this disease consists in complete rest, keeping the animal in a dark place, and solutions of cocaine and atropine, and the administration of saline laxatives.

Purulent Inflammation of the Eye (*Panophthalmitis*).—This is produced by serious concussion of the eye itself. It may also be due to septic wounds of the cornea and sclerotic membrane, as well as to the large perforating ulcers of the cornea. We recognize the following acute symptoms:

The eyelids are constantly closed; great redness of the conjunctiva; total opacity of the cornea; purulent accumulations in the anterior chamber of the eye (hypopyon); great hardness and enlargement of the bulbus. After a short time we may have perforation through the cornea, and, in rare cases, through the sclerotic membrane. The lens and vitreous humor are ejected through the opening with the purulent mass; the eyeball collapses, becomes contracted, and forms a knob-shaped mass in the eye; the lids completely collapse and form a hollow in the face. The only thing to do in such a case is to perform enucleation, or removal of the eye. See Removal of Eyeball.

Glaucoma and Hydrophthalmus. Dropsy of the Anterior Chamber.—It is impossible to draw a distinct line between these two conditions. The anterior chamber is very much enlarged, hard and tense, so much so that the eyelids cannot be closed (goggle eye, exophthalmus). The blood vessels of the conjunctiva and the sclerotic membrane are injected, the cornea more or less opaque, the pupil much contracted and greenish in color, insensibility of the cornea, and dilatation of the pupil. The animal has partial or total loss of eyesight, congestion of the conjunctiva, and greenish coloration of the pupil. Treatment consists of a few drops of physostigmin solution 1 to 100, which tends to reduce the intraocular pressure, and puncture of the cornea. In chronic hydrophthalmus the entire eyeball had best be removed. Iridectomy is performed in man for glaucoma and Græfe has recommended it for the dog.

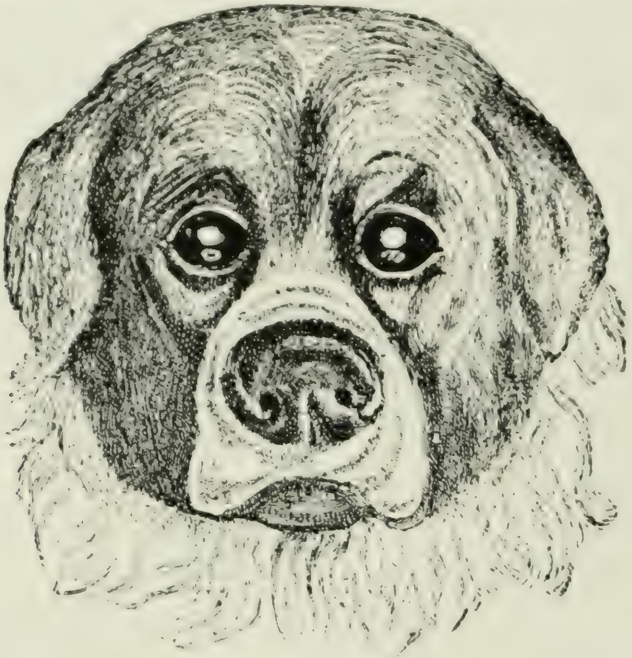


FIG. 200.—Iris coloboma.

So-called **Hemophthalmus** presents the symptoms observed in the acute stage of glaucoma and hydrophthalmus. It is caused by traumatic insults with dull objects (contusions). There is hemorrhage either into the anterior chamber of the eye which then appears red (hyphema) (this may also occur in hemorrhagic iritis) or into the vitreous humor which becomes cloudy and breaks down, etc. Cool applications in the beginning and warm moist antiseptic applications in the later stages followed with remedies that promote absorption as recommended for hydrophthalmus and glaucoma are recommended.

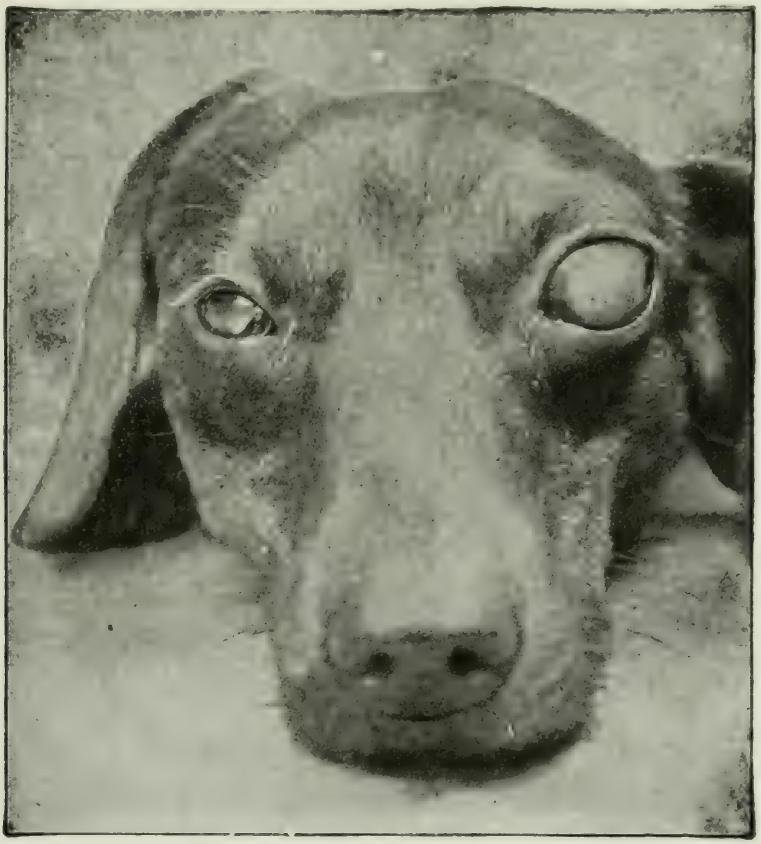


FIG. 201.—Hydrophthalmus; on other eye luxation of lens in the anterior eye chamber.

Diseases of the Vitreous Humor.—These are generally congenital and are observed with the ophthalmoscope. The vitreous humor is found on examination to be filled by a filiform or striated opacity; in some cases the vitreous humor is found to be a mobile liquid. There are a number of other changes, but this condition is incurable, and merely for diagnostic purposes, consequently, works on the eye are to be consulted. Of these diseases there are a number of anomalies, but the most important are hemorrhage of the retina, inflammation of the papilla of the optic nerve, and detachment of the retina, total cataract and a partial luxation of the lens, liquefaction of the vitreous humor of the eye, swelling of the papilla, and injection of the vessels of the retina.

Hemorrhage of the Retina.—This may be caused by violent traumatism and from certain diseases such as scurvy, ptomaine poison and from poisoning from male fern extract given for tape-worm. Those which are only visible with the ophthalmoscope are round, irregular line-like bodies, brownish-yellow, which gradually become light yellow or white. Treatment is generally useless. Rest, moist, warm compresses, the application of a 1-per cent. solution of iodide of potassium, a few drops in the eye once or twice daily.

Inflammation of the Papilla of the Optic Nerve (*Papillitis, Neuritis Intraocularis*).—This is apt to be found associated with pathological conditions in the other structures of the eye from certain infectious diseases—distemper, septicæmia, ptomaine poisoning, and rarely traumatisms. The papilla when examined by the ophthalmoscope is found to be hyperæmic, with more or less projection of the papilla, and congestion of the surrounding vessels. When the active symptoms subside the papilla atrophies, becomes grayish-white and becomes oval or circular.

The treatment consists in keeping the animal in a dark room, administering strychnine and local applications of sedatives, and small doses of calomel.

Congested Papilla.—In this condition the papilla optica suffers a considerable increase in volume, frequently as much as twice the normal and as a result it forms a button-like projection or resembles the cap of a toad stool. The color of the papilla is yellowish gray or grayish white, the veins are much distended and dip vertically into the papilla; sight is interfered with and pupillary reaction is disturbed. Bilateral congested papilla occurs in the presence of intracranial tumors while unilateral congested papilla may be caused by abnormal conditions in the orbit, viz., neuritis retrobulbaris, hemorrhage, tumors, inflammatory processes.

Detachment of the Retina (*Amotio Retinæ*).—This is indicated by more or less separation of the choroid and opacity of the vitreous humor when there is complete separation of the retina; the whole membrane becomes converted into a funnel-like body. This condition has been observed quite frequently. Moeller has found numerous cases of detachment of the retina, and could find no predisposing cause. Subretinal cysts are occasionally found in the retinæ of old dogs, and present the same symptoms as this disease. Treatment is useless.

Amaurosis. Black Cataract.—Under this title we class all of those morbid states where there is partial (amblyopia) or complete loss of eyesight or blindness (amaurosis) without any change in the external portion of the eye. In the majority of cases it is due to pathological process in the retina or the optic nerve, namely retinal hemorrhage, separation of the retina, papillitis, retinitis, or atrophy of the optic nerve. In rare instances it is due to direct pressure of hemorrhages on the optic nerve, or to inflammations to neoformations in the orbit, or at the entrance of the optic nerve, or it may be due to certain lesions in the cranial cavity, such as inflammation, hemorrhage, tumors, parasites, which are located in the base of the brain near the optic centre. Certain poisons have a specific effect on the optic nerves and cause permanent or temporary blindness such as nicotine, salicylic acid, extract of male fern, santonin, carbon dioxide, or decayed meat toxines. The sight is sometimes affected by sporting dogs working in the field when it is covered with snow. Congenital amaurosis cannot be said to be extremely rare, it being rather common in toy terriers and particularly so in Boston terriers.

Symptoms.—When a dog is blind in both eyes it is not difficult to determine the condition, on observing the careful method of walking, the absence of fright when menaced with a stick or hand, and the very much increased use of the sense of smell, or of hitting obstacles or walking into them, and, in addition, the fixed, stary look, and the dilatation of the pupils which do not contract in the presence of strong light. Cases have been observed where there was pronounced amaurosis and while the pupil was ordinarily dilated, when the animal was brought into strong light the pupil contracted. Where there is partial or complete loss of sight in only one eye, it is more difficult to determine the condition. Blind one eye with some dark material and try to see whether the pupil dilates and contracts with the light. A peculiar form of blindness is hemeralopia (night blindness). In such animals the sight is perfectly good in the day, but at night the sight is partially lost and the animal has no confidence in walking about. This condition is found to be due to a peripheral opacity of the refractory mediums. The treatment consists in the attempt to remove the exciting cause, if possible.

Prolapse of the Eyeball.

(*Exophthalmus; Prolapsus Bulbi Oculi.*)

There are a number of causes, usually traumatic in nature, that produce prolapse of the eyeball. It may be crowded out of the cavity of the eye, or exposed in its external circumference by the swollen and distended eyelids which are closely adherent to its posterior surface (Fig. 202). This condition occurs specially in bulldogs, pugs and the toy spaniels, although it may occur in any breed. The dog does not possess a complete bony arch of the eye (zygomaticus), the space being filled up by a ligament, and the muscles are also very weak. Occasionally, from some mechanical force, such as blows in the region of the eye, or bites in its neighborhood causing hemorrhage and a large amount of blood to collect in the posterior part of the orbit, it is pushed out of position. Frequently the entire eyeball is crowded out, standing out on the face clear of the orbit (tumors, etc.). Simple pressure of the fingers on the supraorbital cavity of pugs or spaniels is sufficient to make the eye protrude, opening the eyelids mechanically; luxation of the inferior maxillary also causes protrusion of the eyeball. It is also observed in that rare affection called Basedow's disease. This condition has been noticed in very rare instances to be due to inflammatory processes inside the eye, and by the formation of tumors in the orbits.

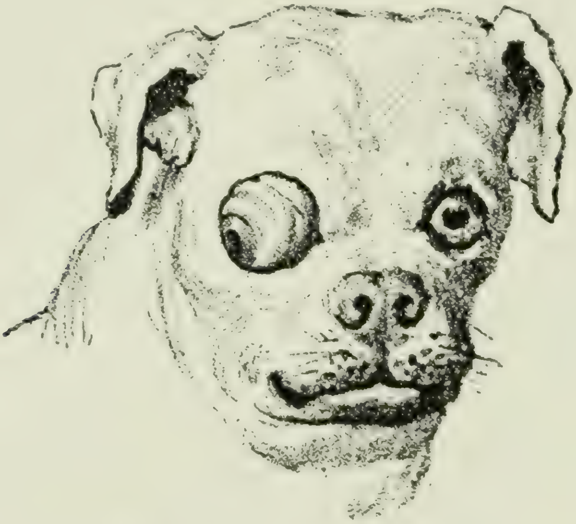


FIG. 202.—Dislocation of the eyeball.

The prognosis of a prolapsed eyeball depends largely upon the circumstances and condition of the organ. If the prolapse is of recent origin, if the muscles of the eye and optic nerve are not torn, and if the eye itself has not been very much injured, we may expect complete recovery in a short time without any disturbance of sight. If the prolapse is recent and the muscles are not torn, or only partially so, but the eye is abnormally distended, we must expect there is some irritation of the optic nerve, and while the eye may be restored the animal may remain blind. If the muscles of the eye and optic nerve are lacerated and the eye proper is injured, or if any of the chambers of the eye are filled with blood, or if the prolapse has been sufficiently long that the irritating influence of the air is marked by an opacity and a dry look of the cornea, which assumes a horny appearance, the eye must be considered as lost.

The therapeutic treatment consists in returning the eyeball as soon as possible, especially when the organ appears to be in such a condition as would encourage you to think it can be saved; but if otherwise, it must be removed as soon as possible.

We try to return the eye to its position as soon as possible.

First, clean it thoroughly by means of an antiseptic that is not irritating, such as a 2 per cent. solution of boric acid or a 1 to 2000 solution of corrosive sublimate. Place the flat of the hand or the points of the fingers on the eyeball, at the same time an assistant distending the eyelids as much as possible, and by gentle pressure endeavor to push the eye back into the orbital cavity.

If it is impossible to return it by this means, the fissure of the eye must be enlarged by making a small incision in the external corner, or the anterior chamber of the eye may be perforated by means of a cataract needle or sharp bistoury, so as to empty the eye to a certain extent and thus allow it to return to the chamber. After returning the eye we must try to prevent another prolapse by placing a bandage over the eye, taking care not to compress the eyeball too much. If the animal will not allow it to remain, we must join the eyelids with one or two stitches. After stitching the eye we generally see great inflammation of the lids and the eye itself, but the writer has found that these bad effects may be easily prevented by taking care not to carry the stitch through the entire lid, but only through the external membrane. At the same time it is advisable to keep the animal without food for at least twenty-four hours, for the use of the jaw, and especially the pressure of the prolongation of the crown of the inferior maxillary, may push the injured eye out of position. Cold applications are useful if the eyeball cannot be saved, or if reduction is impracticable for some reason or other, on account of tumors in the orbit, etc., there is nothing left to do but enucleate the eyeball.

Enucleation. Removal of the Eyeball.—Removal of the eyeball should be performed under a narcotic or ether, or continual applications of 4 per cent. solution of cocaine. We pull out the eyeball by means of a tenaculum or a thread is put in the body of the eye, cut through the conjunctiva with a pair of small curved scissors closely behind the cornea, snipping the scissors around the eye, keeping as close to the bulb of the eye as possible, and by this means separate the muscles and then cut through the optic nerve. The author thinks it is advisable to remove the membrana nictitans at the same time (Fig. 203).

After enucleation, the cavity of the eye is washed out with an antiseptic fluid and the bleeding is stopped by means of a tampon; and the cavity should be powdered with boracic acid or sulphonal. Pack the orbit with absorbent cotton and put two stitches in the eyelids. The stitches and packing must be removed in twenty-four hours. The further treatment consists in cleaning out the cavity with corrosive sublimate solution (1 to 3000) twice daily. Dogs are not badly disfigured by the loss of one eye, as the orbit becomes contracted and partially filled with granulations. It is not advisable to use artificial eyes, as the animal generally rubs them out, and such operations as tattooing the stump, only removing the anterior portion of the eye, or cleaning out the contents of the eyeball and stitching up the sclerotic membrane are not only invariably impracticable but very apt to act an as irritant and cause a constant discharge from the cavity, and the empty orbit always presents a disgusting appearance.

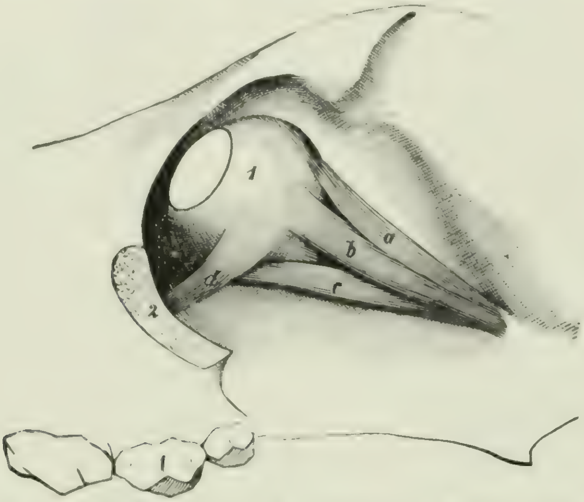


FIG. 203.—Muscles of the left eye: *a*, Superior; *b*, external; *c*, inferior straight muscles of the eye; 1 eyeball; 2, orbital arch cut through.

Strabismus. Squinting, cross eye.—Strabismus divergens is the usual form observed in the dog. Strabismus convergens is less common. Abnormal vertical position of the optic axis is equally rare. In most cases the latter is due to a congenital disproportion between the size of the eyeball and that of the orbit (the eye is too small—microphthalmus or atrophia bulbi). Intraorbital tumors, hemorrhages or inflammatory exudates may force the bulbus to one side, or paralysis of certain muscles of the eye (resulting from certain pathological processes in the region of the pons or crura cerebri) may cause strabismus. Occasionally strabismus is seen after the replacement of a prolapsed eyeball. Treatment of strabismus must be directed at the underlying cause and for this reason is frequently in vain. **Strabismus paralyticus,** resulting from paralysis of some of the oculo-motor muscles might be remedied by severing the muscles on the opposite side.

Nystagmus.—This is an involuntary rapid movement of the eyeball, principally oscillating and rotary (nystagmus oscillatorius and nystagmus rotarious, respectively). It occurs in the course of acute cerebral diseases, distemper, certain intoxications (poisonings) and in epilepsy. Not infrequently it is congenital and then associated with microphthalmus and blindness. Treatment must be directed at the cause.

Anomalies of Refraction.—Deviations from the normal, in the light-refracting media of the eye (myopia, hypermetropia and astigmatism), are of little importance in the dog. In the first place correction of these defects by means of spectacles is impractical and in the second place it is by no means logical to assume that such corrections, even though practical, would be of any advantage to the animal. This view is based upon the demonstration of Boden that myopic dogs can see better with their natural defect than when such natural defect has been corrected with properly fitting lenses. Boden examined 100 dogs according to the method of Schmidt-Ruempler, making 776 determinations for errors of refraction and found all of these animals myopic. The extent of the myopic condition varied from 1.5 to 6.0 Diopters—average 3.2 D. Furthermore it seems that the dog is **normally amblyopic.** Similar observations were made and practically the same conclusions were reached by different methods employed by von Pflug. Not a single dog examined by the latter shows pronounced hypermetropia and only one showed emmetropia (normal refractive media), while all the rest were myopic, though to a less degree than that determined by Boden according to the Schmidt-Ruempler method.

Astigmatism of the cornea, which is due to asymmetrical refractive properties of this transparent medium is the only anomaly of this character that would be of interest. It may be congenital, or acquired as a result of various pathological processes that give rise to irregularities in the normal form of the cornea. The condition may often be recognized by naked eye inspection, in other cases (in clinics and for scientific purposes) we make use of the keratoscope. For practical purposes the reflection of a candle flame or that of a window cross-bar is utilized in making a diagnosis. More detailed discussion of this subject should be sought in special works.

DISEASES OF THE EAR.

Serous Cyst.

(Othematoma; Hematoma.)

By this term we mean a hemorrhage into the subcutis or under the perichondrium of the ear, and forming a tumor in the external or internal part of the lobe. It generally occurs on the inside of the lobe. In rare cases it has been found in the external side, and in still rarer cases both inside and outside. This swelling is fluctuating, and when the skin of the animal is white it may have a bluish coloration.

Etiology.—This condition is probably due entirely to traumatic cause; for instance, by striking the ear against the collar or muzzle, pulling the ear, concussions, and injuries through biting; or from constant shaking the ear due to the continuous itching and irritation of disease of the middle ear and from irritation of parasites, or ulceration of the edges of the lobes. It is always seen in the lobe of the ear; it is general in dogs with long ears. If the sac is not emptied by surgical means, the secretion remains fluid and to a certain extent is reabsorbed, but rarely is the secretion entirely reabsorbed and it may leave quite a thickening and even malformation of the external ear, and when the sac is emptied by surgical means after the collection has been there some time we find that there is very little serous fluid left, but organized masses of filiform neoformations. Suppuration is rare and probably occurs only when there is an external wound. This, however, is very rare, being generally associated with some later traumatisms.

Clinical Symptoms and Prognosis.—The swelling, as a rule, is on the internal part of the ear. This enlargement varies in size from a pigeon egg to a chicken egg, spherical or oval in shape, usually well defined in outline. The lobe, which generally hangs downward, is pushed upward in a peculiar manner (Fig. 204). The swelling is hard, and in white animals it has a blue color. It is usually little sensitive to pressure and shows a distinct fluctuation. The animal carries its head in an oblique manner, the affected ear being held downward, and when the collection is of some size the ear stands out from the head, and the fact that it gives the dog more or less pain is indicated by the careful way that the animal shakes its head or scratches its ear.

The prognosis is favorable provided proper treatment (incision, etc.) is applied, although it may take some time before it is entirely cured.

Compression of the ear by means of bandages has been found to favor the course of healing very materially.

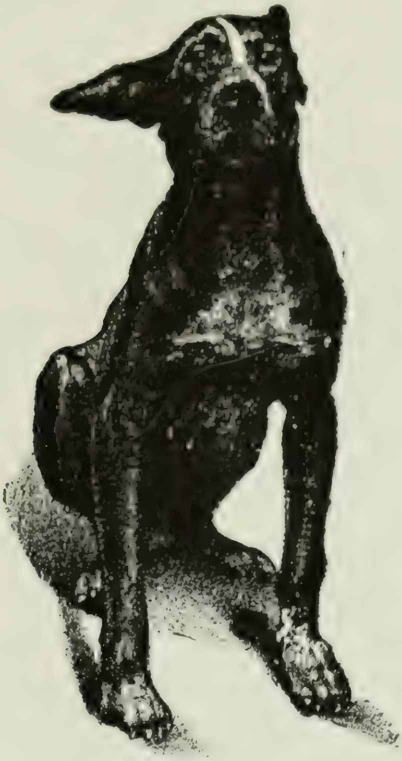


FIG. 204.—Hematoma of the ear.

In many cases where no dressing is applied, we may have as a sequence a slight thickening of the lobe of the ear. This, however, is of very little importance, as it usually disappears in the course of time.

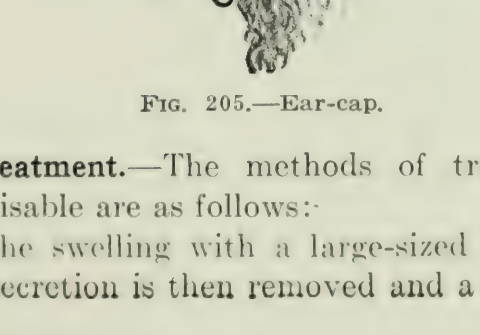


FIG. 205.—Ear-cap.

Therapeutic Treatment.—The methods of treatment which the writer considers advisable are as follows:-

We perforate the swelling with a large-sized hypodermic syringe or aspirator. The secretion is then removed and a solution of iodine 1, iodide of potassium 6 and alcohol 16 is injected into the cavity. We then apply a compressing dressing in the following manner:

The ear is covered with antiseptic wadding on both surfaces. It is then held in position by means of an ear-cap (Figs. 205-6-7). This dressing must not be displaced, but allowed to remain for days. This method has been an element of uncertainty; in some cases it acts perfectly and in others, beyond setting up considerable irritation, it does not destroy the secreting surface and the abnormal condition returns.

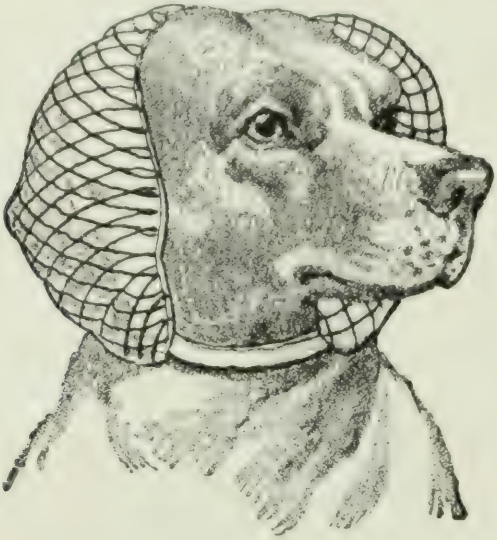


FIG. 206.—Ear pouch.

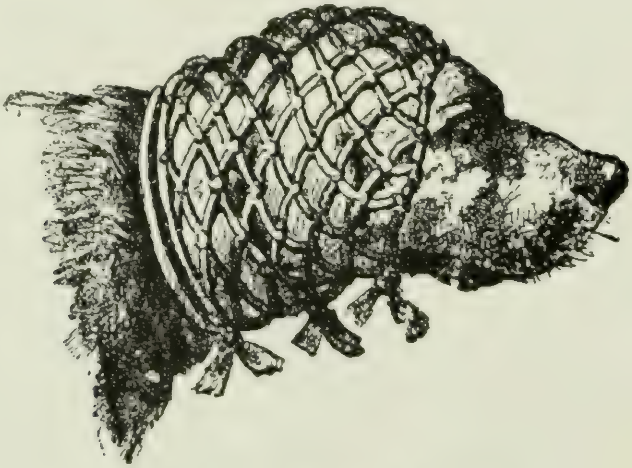


FIG. 207.—Ear hood or net.

McQueen's method is very simple and produces good results. He carefully removes the hair from the ear and renders it antiseptic, and either paints the ear with cocaine or administers chloroform, empties the sac by means of an aspirator syringe, and makes sure that it is completely emptied. Sutures are then inserted radiating from the centre of the sac, about one-third of an inch apart, directly through the ear and tied on the outer or hairy side, thus producing a firm pressure between the two surfaces of the sac and by that means get prompt union. The ear must then be irrigated with an antiseptic solution, carefully removing all blood, etc., and dressed with antiseptic wadding, and further covered with an ear-cap. It should be dressed every day, and the sutures removed at the end of a week.

Another method consists in taking a scalpel and making a free incision from one end of the sac to the other, then filling it in with tincture of iodine, and then keeping it clean and using an ear-cap. Uebele modifies this method by making interrupted incisions.

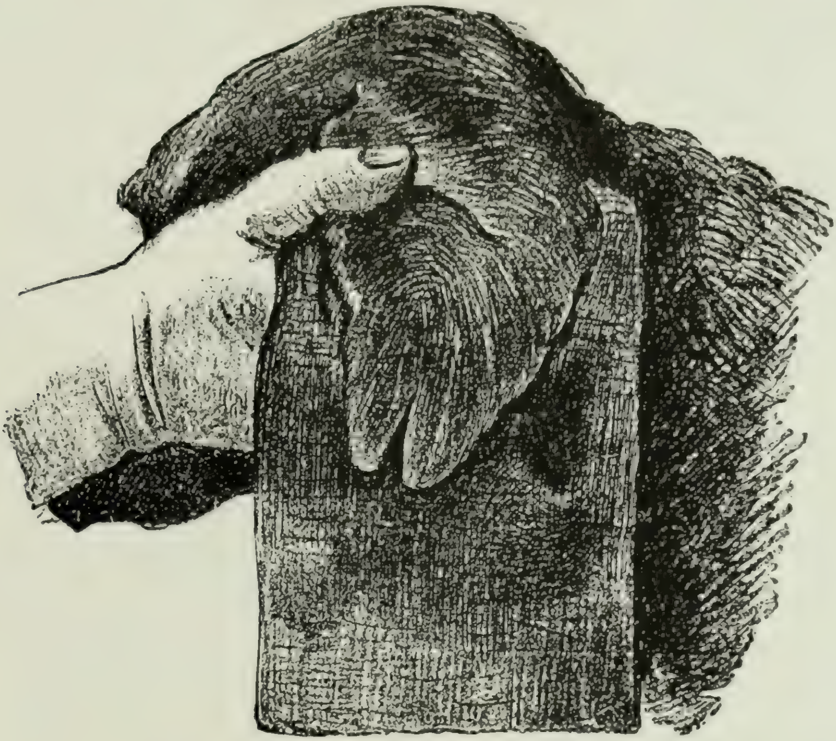


Fig. 208.—Mode of bandaging the ear.

Simple emptying by means of a trocar or making a small incision never produces any good results, as the opening closes immediately and it soon fills up again. Sutures are not advisable, causing great irritation. In order to prevent the too rapid closing of the incision, the removal of a small crescent-shaped piece of flesh from the edge of the opening has been recommended.

Ulceration of the External Concha.—External Canker.

By this we mean a purulent or ulcerative process on the edge of the external ear. This, however, is not confined to the edge, but may spread over different parts of the lobe. Has a chronic course.

Etiology.—The chief causes of this trouble are injuries and lacerations of the skin. Dogs are liable to scratch or shake the ears violently against the muzzle or collar, producing an inflammation. It may also be developed from the ear itself, as in cutaneous inflammations of the external auditory passages. We may also see this as a result of wounds or lacerations of the ear caused by bites of other dogs, which from neglect or improper treatment become ulcerated and do not heal readily on account of constant shaking of the ear. This affection is almost entirely confined to animals with long ears and short hair, especially Dachs Hunds.

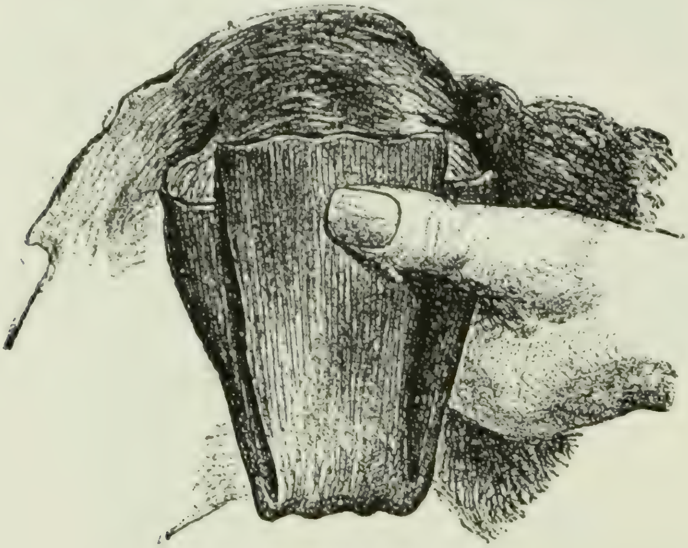


Fig. 209.

Clinical Symptoms.—The animals hold their heads to one side, shaking the ear frequently, sometimes keeping it up so long that the ulcerated surface bleeds and the blood is thrown in all directions. They attempt to scratch the affected ear with their paws, and are very sensitive about having them touched. On making an examination we find at the edge of the external ear, generally at its extreme end, an ulcer or a number of them which are covered with a blackish loose scab with turned-up edges, and the tissues of the immediate neighborhood are œdematous.

Therapeutic Treatment.—The first procedure is to ascertain if there are any evidences of internal otitis, if so, heal that and lessen the irritation and itching. Next prepare an ear-cap (Fig. 205), which is so very essential in this affection. Dress the inflamed edges first with an antiseptic solution and get all the scab-dirt, broken down tissue and hair away then paint the edges with compound tincture of benzoin and apply this daily, keeping on the ear-cap. Other ointments, such as airol, benzoin and lanolin, or stimulant counter-irritants, such as iodine or nitrate of silver may be employed, also iodoform, dermatol, xeroform, airol. The writer has found the following method very efficacious: Clean the ear thoroughly, then apply freely some drying powder, such as dermatol or boric acid, on both sides and the edges of the ear. Have prepared an oblong piece of linen or muslin as in the accompanying illustrations (Figs. 208, 209), cover this with liquid glue and apply it as seen in the Fig. 209; this is held in position until dry. When it is to be removed the ear can be steeped in warm water and it is easily removed. It is best, however, to let it remain until it falls off, as by that time the ulcers have healed and the scabs and hair come off with the bandages. In very small animals silicate of soda solution or rubber adhesive plaster can be substituted for glue, but in ordinary sized dogs the glue is the most efficacious. When there are a series of deep tears or chronic separations of the ears, and the edges of the ears are in a chronic state of inflammation, with more or less induration of the tissue, there is no doubt that the quickest results may be obtained by cutting off a portion of the diseased lobe of the ear; this, however, disfigures the animal very much. This operation is generally performed on animals under the influence of ether. First remove the hair and thoroughly disinfect the parts and cut off a circular piece from the ear that will include the torn portion, being careful not to remove any more of the lobe than is actually necessary. Another method is to cut off the edges of the slit ear a thin section about one-eighth of an inch in thickness, so as to insure two raw fresh surfaces. The two edges of the wound must then be drawn together by means of sutures, using care not to include cartilage in the stitches. These should not be inserted too close to the edge of the wound, as they are apt to tear through. The stitched line is then powdered with sulphonal. The external ear is covered with wadding, turned over the top of the head, and held in position by means of a bandage, as indicated in Figs. 206 and 207.

The writer has been able to obtain satisfactory results in slight cases of external otitis and canker by covering the ulcer with oxide of mercury and tying the ear in a cap.

Inflammation of the External Auditory Canal—Internal Canker.

(*Otitis Externa.*)

The external auditory canal, i. e., the tubular continuation of the concha which extends to the drum membrane or membrana tympani, is formed chiefly by a cartilaginous structure (the bony portion being limited to a mere ring). It is protected by a continuation of the cutis which, in this region, contains few hairs and two kinds of glands, sebaceous glands and ceruminal glands. The former are much more highly developed, more convoluted as well as more numerous than the latter. The sebaceous glands produce a fatty secretion, the ceruminal glands a mucilaginous fluid (reacting with mucicarmin) and a pigment, but no fat (Hegewald). The natural mixture of these two secretions constitutes the "ear wax." The membrana tympani has the form of a concave oval disk set at an acute angle to the walls of the auditory canal. (See Fig. 210.)

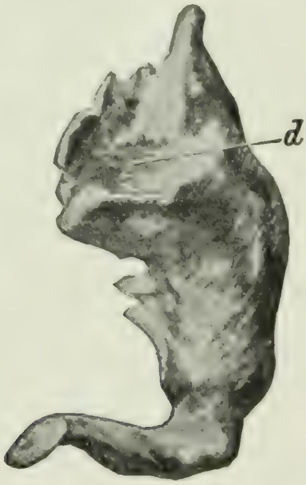


Fig. 210.—Metal form of the external auditory canal with adjoining ventral section of auricle of dog: *d*, Impression of anthelix.

This affection consists of an inflammatory irritation of the external canal of the ear. It occurs most frequently in dogs with long ears. It is generally of an eczematous nature and appears in a diffuse form, extending over a larger part of the lining of the ear. It is accompanied by redness, swelling of the membrane, and an exudation of a serous, and, later in the chronic course, a purulent secretion. It involves the papillary body and the wax secreting glands of the ear. The skin is tumefied, red and warm, there is abundant epithelial desquamation; the ceruminous glands secrete a very much increased amount of abnormal wax, which collects with the secretion of the ear. In some cases the discharge becomes purulent and is found lying in the ear in the form of a viscous fluid, varying in color from yellowish-brown, gray-brown, yellow-brown, or dark brown. This discharge may irritate the skin of the lower part of the ear, causing an erythema. We may also have the formation of abscesses and contraction of the meatus (caused by thickening of the cutis, by granulations, and by polypus malformations). We may have acute inflammation of the canal extending deep into the lining, and perforations of the tympanum and irritation of the Eustachian canal and discharge of pus into the pharynx. Abscesses of the parietal bone have been observed.

Etiology.—The causes are similar to those mentioned under eczema. It is due to an accumulation of cerumen, dirt, cutaneous scabs, and foreign bodies; also too frequent bathing with soap is a common cause of irritation. Sporting dogs, such as spaniels, setters and retrievers and Chesapeake Bay dogs, from going into icy cold water. It may accompany or follow distemper, or by extension of inflammatory processes from the surrounding tissues, such as injuries, bites, etc. It is also recognized that otitis is produced by mites (see Fig. 212), although their presence does not necessarily always cause serious inflammation. (See Parasitic Otitis. page 577.) Hoffmann states that he has observed serious suppuration in cases where dogs' ears have been clipped too close to the head.

Clinical Symptoms and Prognosis.—Great care must be used in making the first examination of the ear to distinguish between superficial and deep external otitis. In the former form it may rapidly become chronic. The animals shake their heads, and, as the disease is almost invariably located in one ear only, they hold their head in an oblique position, trying to scratch the head about the base of the ear or to rub it against some object. They carefully avoid any attempt which is made to touch the ear, and show great pain when the base of the concha is touched. Milder cases rather encourage manipulation of the ear and if the ear is gently rubbed they show every sign of pleasure. In examining the external ear we use a forceps-shaped speculum or ear-mirror. The use of the speculum shown in Figure 211 affords certain advantages; it is expressly noted, however, that even when the tortuous auditory canal

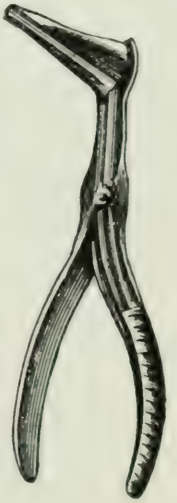


FIG. 211. Kramer's ear speculum.

has been partially stretched into line by manipulation of the concha, only the anterior portion can be brought to view—the membrana tympani can not be seen. The difficulty lies not only in the tortuous character of the canal but in the decreased size of the lumen resulting from the swollen cutis and from the peculiar angular position of the membrana tympani. Other forms of ear speculæ offer no advantages over the one shown in the illustration. In view of the fact that the use of the speculum in these conditions is extremely painful, it is urgently advised to put the patient under the influence of morphin before operating. If we distend the canal we generally find it filled with a fœtid, grayish-green, or reddish liquid consisting of gradular secretions, fungi, cutaneous scabs, pus, acari, etc. After the organ is cleaned out we find an intensely red, swollen, sometimes ulcerating surface of the skin. In the deep-seated cases the meatus is almost entirely closed by thickening of the cutis and an abundant purulent discharge from the ear (otorrhœa). Numerous granulations appear quickly and in some cases where both ears are affected we may have symptoms of impaired hearing or deafness. A characteristic smacking or sucking liquid sound is produced by side pressure or rapid compression on the base of the ear.

Perforation of the membrana tympani is a rare but serious termination of deep-seated otitis externa—resulting in otitis media and interna. Manifestation of excessive pain, sensitiveness to pressure applied immediately below the ear, "swallowing" movements of the patient when fluids are injected into the external auditory canal and severe disturbances of the general condition (loss of appetite, fever, vomiting, fainting, convulsions) may indicate this accident. Inflammation of the middle ear, however, may also result from pharangitis through the medium of the Eustachian tubes, or as a complication of distemper. The prognosis is unfavorable.

Otherwise the general condition of the patient with otitis externa is usually little disturbed—only slight pain and a little itching.

In purulent otitis there may be fever with corresponding depression.

Therapeutic Treatment.—The treatment which corresponds with that of eczema is generally followed. We must thoroughly clean the external ear. This can be done by tying a piece of absorbent cotton or a piece of sponge on the end of one of the ordinary orange sticks used in manicuring (Fig. 213), dipped in alcohol or ether; warm water, made slightly alkaline, can also be used—the two former, however, are to be preferred. When the condition is chronic a syringe must be used to get into the deep parts of the ear and the best for this purpose is one made entirely of soft rubber with a long flexible point that can be pushed into the meatus without any great danger of injuring the canal; the flexible point adapts itself to the turns of the external ear canal, and by using applications of warm water injected into the meatus the latter can be thoroughly cleansed of accumulated cerumen, crusts, etc. The canal is then dried with absorbent cotton introduced into the ear on the end of a small pair of forceps, using every precaution to remove all injected liquids. In some chronic cases great benefit is to be had from injecting peroxide of hydrogen into the ear, as it cleans it out thoroughly, but under no circumstances must this be repeated frequently as the peroxide solution, while it has great cleansing properties, if repeated frequently, attacks the normal structure of the ear and frequently the writer has had brought to him cases where the whole inside of the ear and

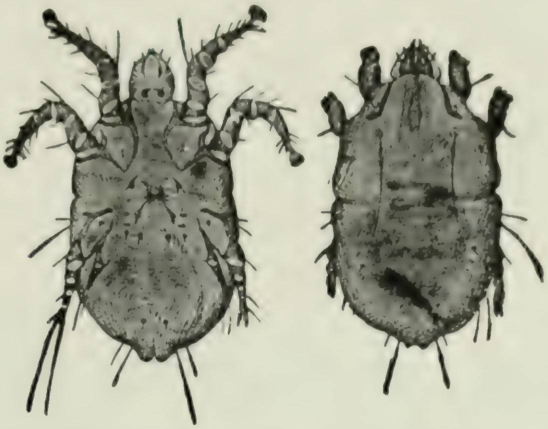


Fig. 212.—Dermatophagus auricularis. Left—oviparous female—ventral view. Right—same—dorsal view.

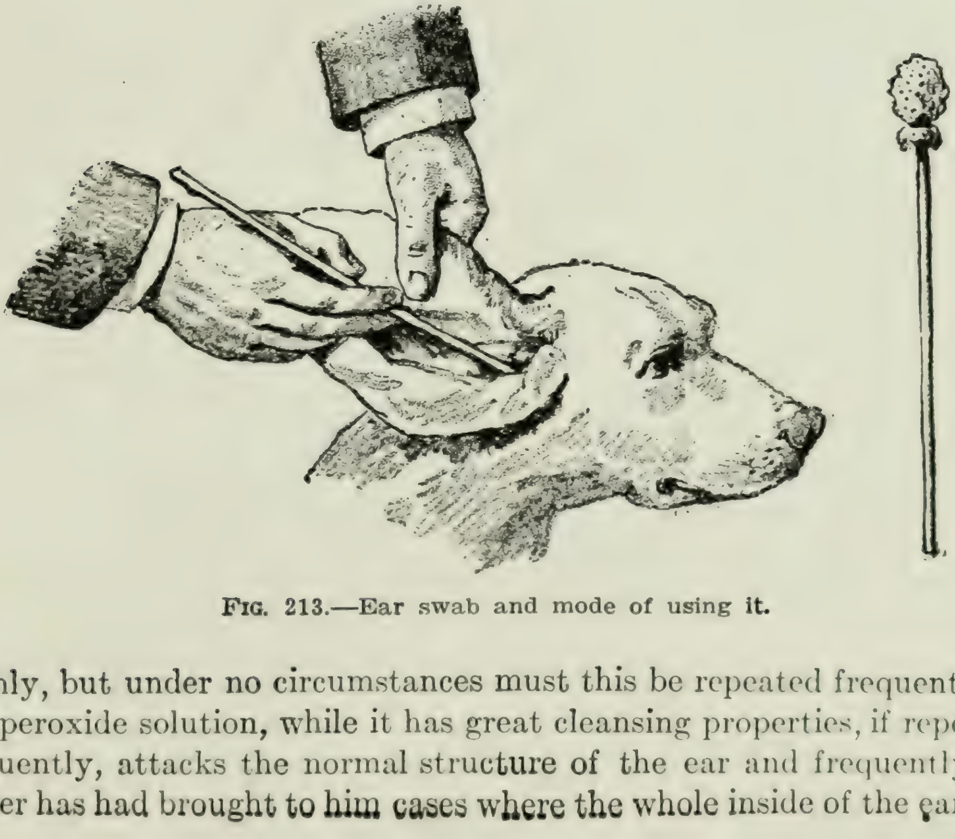


Fig. 213.—Ear swab and mode of using it.

concha was a mass of granulations, in what was originally a very mild case, caused by the action of the peroxide solution.

Syringings with water and fluids of any kind must not be used for any length of time, as they are apt to carry the débris of the condition, such as wax, pus, mucus, scab, etc., down into the middle ear. On the other hand, it is well to clean out the ear thoroughly once or twice with a syringe with a flexible point. As the meatus is elongated, narrow, and greatly curved, there is not much danger of injuring the tympanic membrane. In very slight affections of this character, which may be recognized by a slight redness of the membrane, itching, and the presence of a certain amount of fluid, it is only necessary to clean the meatus once or twice, using solutions of lead-water. The writer has found that simply powdering with lycopodium, amylum, talcum, or boracic acid and filling up the ear, and then massaging the base of the concha to work the powder well down into the ear, is much preferable to any of the above-mentioned liquids.

A mode of procedure suitable to most cases is to clean the ear with alcohol, ether or spirits of camphor, filling in the cavity and working the alcohol into the canal by manipulation of the base of the ear. It is then to be dried thoroughly with absorbent cotton until all trace of brown coloration, characteristic of this condition, is removed. Then fill up the ear with powdered boric acid, working it thoroughly into the canal, and covering all the inflamed portions. This should be repeated every third day until the irritation is lessened, and then after that, once a week. With this treatment also prescribe a laxative, such as a tablespoonful of saturated solution of sulphate of soda (glauber salts) or some of the saline laxative waters. If there is eczema present, add to the treatment two drops of Fowler's solution, morning and evening.

If the secretions have become excessive their continued accumulations should be removed daily (or oftener), not with a small sponge as is permissible in milder cases but exclusively with carefully made cotton swabs, followed with any of the various antiseptic and drying powders recommended, viz., iodoform, iodoform with dermatol (1 to 10), dermatol alone or in combination with talcum or starch, zinc oxid with talcum, loretin with talcum or starch, xeroform, tannoform, thioform, itrol, boracic acid, bor-creolin, pulvis salicylicus cum talco, etc., applied daily and at least following each cleansing operation. If there is excessive pain or much itching repeated applications of cocain or anesthesin ointment (1 to 25 or 30, or 1 to 10 or 20, as the case may require) sometimes give quick results. Oil of henbane gives similar results but is less reliable. Deep-seated ulcerations may be treated with alcohol, tincture of aloes, tincture of myrrh, or solutions of boracic acid, salol, salicylic acid or resorcin dissolved in alcohol (1 to 30 or 50), tannin and glycerin (1 to 20 or 30), creolin, carbolic acid or nitrate of silver in alcohol (1 to 50 or 100), or chronic acid in water (1 to 50 or 100), also iodin ointment, Lugol's solution, hydrogen peroxide (3%) or potassium permanganate (1 to 100). Alcoholic preparations have the advantage of being more penetrating, even though at times their first effect may be to aggravate the trouble. In cases where these, after continued use, seem to be too severe in their action, ointments and liniments are preferable. If suppuration is excessive the daily application of **iodoformull tampons** is recommended. Luxurient granulations can be kept in check with nitrate of silver or the thermocauter. Papillomatous growths may be removed with scissors, wire ecraseur, curette, or may be twisted off with forceps. Where there is chronic constriction of the auditory meatus the use of **salicyl-oil** (1 to 30 or 40) or of **salicyl-ointment** (1 to 10 or 20) often gives surprisingly good results.

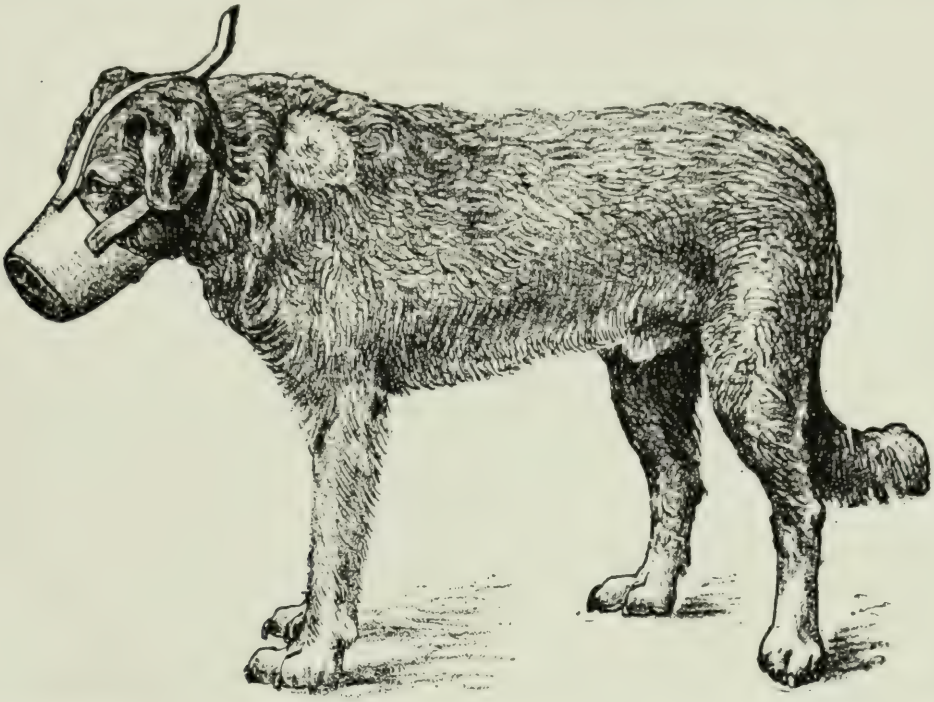


FIG. 214.—Moist eczema of the shoulder, and muzzle to prevent the animal biting it.

Hoffmann treated a very obstinate case by exposing the auditory meatus with an incision, inserting a drainage tube and treating daily with disinfecting powders.

For the treatment of mites in the external auditory meatus (Scabies auricularis) Peru balsam, styrax liniment, carbol-oil, creolin oil or a mixture of B Naphthol one part, Ether one part and Paraffin oil 20 parts may be used. In regard to treatment of distemper exanthema and acanthosis nigricans, see special chapters.

℞	Zinc. oxydat.	3.0
	Talcum	12.0
	M. D. S.—Ear powder.	

℞	Bismuth. subgallic.	3.0
	Amyl nitris.	
	Talc.	āā 6.0
	M. D. S.—Ear powder.	

℞	Zinc. oxydat.	6.0
	Ol. camph.	
	Ol. hyoscyami	āā 30.0
	Misce fiat Linimentum.	
	D. S.—Ear liniment.	

℞	Cocain hydrochloric.	0.5
	Adip. suill.	15.0
	Misce fiat Unguentum.	
	D. S.—Anodyne ear ointment.	

℞	Phenyl. salicylic.	2.0
	Spirit.	80.0
	M. D. S.—Ear tincture.	

Deafness, Partial or Complete.

External otitis may sometimes produce either partial or entire deafness. Both of these conditions are due to the entire closure of the external auditory canal either by swelling and filling up with granulations or by polypus formations, collections of wax, etc., and more rarely by extension of the inflammatory process in the middle ear, destroying the tympanic membrane, or up the Eustachian tube from the pharynx or inflammation of the labyrinth, or paralysis of the auditory nerve, as well as certain pathological processes in the cranium, and as a result of certain infectious diseases, particularly distemper. Of course, any disturbance of the sense of hearing or entire deafness which comes from old age or is hereditary will not show any of the symptoms already described. Breeding a pure white-coated dog may produce a congenital deafness. This is particularly seen in bull terrier puppies; in certain strains of this breed it is a common occurrence. The examination generally showed atrophy of the auditory nerve. When a dog is getting deaf he changes his manner very much. He seems strange, does not answer to the call of his master. In certain cases, when an animal is deaf, the loudest call has no effect on him, but a slight blow on the floor immediately attracts his attention. This should be carefully noticed, as certain kennel men, when a dog is protested at a bench show, know this and when they call on their dog at the same time they give a sharp tap on the floor with their heel, which immediately attracts the dog's attention.

When dogs are born deaf they either do not attempt to bark or, if they do, it is a peculiar cry more like a howl.

As a general rule there is very little result from treatment. Where deafness is due to paralysis of the auditory nerve, the administration of strychnine or the faradic current should be tried. Treatment in congenital deafness is hopeless. Where there is a contraction of the external meatus, we may try to dilate it by means of the introduction into the canal of cylindrical compressed tampon sponges.

Parasitic Canker of the Ear.

(*Parasitic Otitis.*)

Dermatophagus Auricularis Var. Canis.

The dermatophagus auricularis var. canis is a parasite that inhabits the ear of the dog, causing an aggravated form of canker (Nocard and Sewell). The parasite which is common to the dog and cat is said to produce a peculiar form of vertigo.

Dermatophagus auricularis (Chorioptes auricularis s. ecaudatus; Otodectes) is characterized in that only the first two pairs of feet of the female have suction discs, the others terminating in long bristles. The last pair of legs is rudimentary. The posterior end of the males carries small processes with rounded bristles. There are a number of varieties—all inhabit the external auditory meatus. Dermatophagus auricularis var. canis inhabits the ear of the dog. (Hutyra and Marek.)

Hering found mites (dermatophagus canis) in an ulcer of the ear which was accompanied by a deep-seated otitis. Nocard describes minutely certain epileptiform fits in which the dog had a peculiar husky cry and rushed about violently, running into various obstacles, and finally fell insensible, and after a number of such attacks became totally deaf. Sewell describes the condition as finding a collection of brown or sooty-colored cerumen in the ear. If the inside of the ear is examined closely a number of tiny white specks, the size of the eye of a needle, are seen to be rapidly moving about the ear, and he believes that the tickling sensation caused by these movements and the biting of the parasite are what produce the irritation of the lining membranes of the ear. Boden examined every case brought to the Dresden canine clinic, but failed to find a case due to parasites. Frick after numerous examinations had the same result. Cadiot and Newmann describe a parasite which causes parasitic otitis (acariasis auricularis, otacariasis).

Symptoms.—The ear is hot and slightly swollen, and on examination it is hard to distinguish it from ordinary otitis. There is, however, less discharge in this condition. The head is carried to one side, and the animal will scratch the base of the ear very gently with its paw and whine in a plaintive way. After having observed a number of animals infected with the parasite, the writer is inclined to think that the carrying of the head on one side and the gentle scratching of the ear are characteristic of the disease, although it is quite as frequently seen in non-parasitic otitis. The epileptiform symptoms described by Nocard have never been observed.

Treatment.—Nocard recommends naphthol 1 part, ether sulphuric 3 parts, and olive oil 10 parts. This should be injected into the external auditory canal once daily, and the ear plugged up with cotton to prevent the escape of the ether. The latter procedure is not advisable, for if the ether is confined in the ear it causes great irritation, and the author has found from experience where he has followed this procedure that while he may not have observed epileptiform fits before the treatment, he has had symptoms simulating them very much after the ear was injected with ether and the cotton plug put into it.

Sewell advises the application of the following liniment:

℞.	Ung. hydrarg. nit.,	4.0
	Oleum amygd.,	32.0

M. S. Apply a small amount to the inner surface of the ear with a camel's hair pencil.

The ear should be first cleaned out with wood alcohol, and then apply the above.

DISEASES OF THE SKIN.

INFLAMMATORY CONDITIONS OF THE CUTANEOUS MEMBRANE.

Inflammatory symptoms of the skin vary according to their intensity, character, or location. The slightest irritation may produce redness, either with or without swelling—this is defined as erythematous inflammation; or we may have a formation of circumscribed, solid, firm protuberances, papillæ, pustules, boils, or granulations. These are ascribed to exudations originating partially in the papillary body, in the Malpighian membrane, and also in the neighborhood of the follicles.

The inflammatory exudation may become reabsorbed in certain cases, so that after the acute period of the disease has passed, the epidermis, which has become loosened, is gradually desquamated in the form of scabs or crusts. We also occasionally see a dark pigmentation after the disease has run its course. This originates from the hæmoglobin of the extravasated red blood corpuscles. If the inflammatory processes and exudations increase gradually in the cutaneous tissue, we may observe two different results. The inflamed area may become covered with a moist, liquid exudation, or the horny layer of the epidermis is raised up by the fluid, and we may have vesicles which raise the granular layer of the mucous strata, and also the deeper layer of the membrane becomes destroyed in the affected region. In the first case it is covered by the deep layers of the membrane; in the latter case the upper surface of the corium is exposed, having lost its vesicular covering.

The liquid which fills the small or large vesicles is deficient in cells in the early stages of its formation, and the liquid is clear or slightly yellow. Later it becomes turbid by the addition of leukocytes, and a number of whitish-yellow cells fill the fluid. In some cases it has this appearance from the very onset. When the liquid contained in the vesicle is yellow and filled with cells it is called a pustule. Sooner or later the covering of the pustules becomes ruptured, and the fluid dries up in a yellow, gray, or brown crust, under which the regeneration of the lost epidermic layer goes on rapidly.

Now and then the inflammatory process shows it is in the neighborhood of a follicle and its sebaceous glands, and we have the formation of a dark red, very sensitive nodule, and finally suppuration of the same membrane and its adjacent tissues. As a consequence of this we find that the glands and canal of exit are filled with purulent or bloody matter. Soon the internal follicles become involved; the masses of matter can be easily pressed out of the orifice of the follicle, and we may have an elasticity of the purulent cavity surrounded by infiltrated cutis in which we find the hair has become entirely detached from the follicle and falls out. This condition is generally a rather serious affection in the dog, as in this animal there are always several follicles which are accumulated into one group with a common orifice, and in every case of cutaneous disease we find a group of affected sebaceous glands.

In very bad cases peri-glandular and peri-follicular inflammation may become so acute that we see the formation of an extended nodule-shaped, dark red swelling, forming a so-called "boil." This is marked after a certain period by a yellowish-green, necrotic thrombus, which becomes detached by purulent disintegration of the surrounding tissue, and is sloughed after the pus has been discharged. In such cases we find that not only is the external surface of the skin impaired, but the corium is affected, and as the follicles are destroyed the hair does not return. The formation of abscesses and ulcerations, also inflammations of the skin, will be discussed further on.

In chronic cutaneous inflammation we may see the formation of hypertrophic as well as atrophic conditions. In the former case we find as a consequence of the constant increase and congestion of blood in the part the formation of superfluous connective tissue, whereby the skin may be thickened several times its normal size and may form large folds or collosities, and in rare cases club-shaped or warty elevations. In the latter case the corium becomes thinner. This is also the case with the epidermis. Its tissue is either greatly reduced or greatly increased in size, and in the latter case the epidermic cells which proceed from the deep part of the tissues do not undergo any horny degeneration, but rather a drying, mummifying process, covering the membrane in the shape of numerous whitish or white-gray scabs.

NON-PARASITIC DISEASES OF THE SKIN.

Erythema.

(*Redness of the Skin.*)

Erythema is due to disorders of the circulation; it is the mildest form of inflammation of the cutaneous membrane and consists either of hyperæmia of the corium in its upper layers (erythema simplex, erythema congestivum), or in addition a slight sero-cellular infiltration of the membrane of Malphighi—erythema exudativa (dermatitis erythematosa).

Etiology.—Erythema is a local irritation of the skin and originates as the result of various external cutaneous irritations which may be mechanical, chemical, or thermic—for instance, animals with thick, wooly coats, having their coats cut short or shaved to the skin; from irritation of the skin between the toes, caused by running through sand; by friction of the collar upon the skin of the neck; bathing in strong creolin mixtures—coal oil, benzine—lying on rough boards; bites of insects; on the abdomen from ammoniacal urine (in catarrh of the bladder); in catarrh of the prepuce, irritating fecal matter, and by slight burning or freezing. Erythema may also appear in connection with various cutaneous diseases, such as eczema, scab, and canine varioloid, and the presence of an enormous number of fleas.

In new-born pups we sometimes observe an **erythema neonatorum** which consists of reddening of all the unpigmented areas of the skin and disappears spontaneously in the course of two or three days.

Clinical Symptoms and Course.—The symptoms consist of a bright arterial redness (in spots or diffuse) of the cutaneous membrane, which disappears under pressure of the finger, but reappears immediately after, and may be complicated in some cases by slight swelling of the epidermis (due to serous infiltration). As a rule, the affected portion is reddened, but not irritable, although, as a rule, the animal evinces pleasure on gentle rubbing of the skin. The course is usually short, depending to a large extent on the cause. When this is suppressed or removed, especially after the itching and rubbing have discontinued, erythema disappears, and in certain conditions it is followed by desquamation of the upper membrane. There is, however, a more or less dark red spot left after the acute symptoms of the disease have lessened. These finally disappear, but very slowly. This is particularly noticeable when the irritation is due to preputial secretion or ammoniacal urine. (See acanthosis nigricans.)

Therapeutic Treatment.—There is not, as a rule, any great irritation and it will be sufficient to remove the cause in order to remove the erythema. If there is a certain amount of irritation, we must lessen it by bathing the animal with lime water and sponging the affected parts with any of the following solutions: lead-water; solutions of alum; bay rum; cologne; benzoin 1 part, alcohol 30 parts; ichthyol or salicylic acid soap; rubbing with salicylic oil (1 part of salicylic acid dissolved in 35 to 40 parts of olive oil and heated slightly); or a mixture of 1 part of glycerine and 5 parts of water; or 1 part of carbolic acid, 10 of alcohol, 10 of water; or 4 parts of creolin, 100 of water; or 1 part of ichthyol, 10 of glycerine, 30 of water; or 10 parts of nitrate of silver, 100 of water

(Friedberger). Frequent dustings of talcum powder is one of the most efficient remedies.

In very obstinate cases we may also use laxatives or purgatives (aloe, jalap, salines, etc.), also the internal administration of arsenic in the form of Fowler's or Donovan's solution.

Urticaria.

(*Nettle-rash.*)

This disease is an acute irritation of the skin, indicated by the formation of circumspect elevations from one to one and a half inches in diameter, and due to a vasomotor neurosis (angioneurosis) of the skin occasionally attended with fever.

Etiology.—This disease is comparatively rare, and except where we can trace it as being due to some known external irritation, such as stings of insects—leptus autumnalis—or turpentine. The real cause of the majority of cases of urticaria is not understood, being due to some internal irritation, the cause of which is unknown. This is classed under the general head of idiopathic urticaria. In the majority of cases it certainly is due to some disorder of the intestines (catarrh of the intestines, constipation, etc.), and it is supposed that faulty assimilation caused the admission into the circulation of certain toxic substances which get into the circulation and are eliminated by the skin, causing local irritation. Schindelka saw a mastiff bitch which was affected with vaginal catarrh and condylomas of the vagina and accompanied by general urticaria, and also saw the same condition in a poodle bitch, during her period of heat. Urticaria may also follow rapid cooling after the animal has been in a great state of excitement. It has also been seen during dentition of the permanent molars.

Clinical Symptoms and Course.—The manifestations of nettle-rash generally show themselves suddenly without any previous fever or other phenomena, such as want of appetite, depression. There appear over the entire body circumspect flat hemispherical elevations, varying in size from a pea to a large bean, on which the hair is ruffled and staring. When two of these elevations become confluent the elevations are much larger; the skin may be itchy, but this is rare. The course is rapid, frequently twenty-four hours after the eruption appears the rash has entirely disappeared, but occasionally a new crop of elevations appears or the disease may take a chronic course (urticaria chronica), but this is only in very rare instances. The eruption may last for a number of days, and when it disappears it leaves a peculiar pigmentation of the skin. Schindelka has called this urticaria pigmentosa.

Urticaria caused by nettles is occasionally seen in hunting dogs that come in contact with these plants. In these cases we have, in addition to the ordinary "blotches," extensive edematous swellings at the neck, the breast and the abdomen. There is also invariably intensive burning or itching which causes the animals to lick and gnaw the affected regions. The irritating plant hairs thus taken up cause more or less intensive stomatitis and pharyngitis with slavering and dysphagia.

Treatment.—In the acute cases, the condition disappears before treatment can be of use. In slower cases, as a rule, saline laxatives, saturated solution of sulphate of soda, Hunyadi Janos, Apenta; and when there is itching use some of the local preparations recommended in erythema.

Eczema.

(*Red Mange.*)

By this we mean fat mange, summer mange, phagedenic scab, scale scab. It is a cutaneous disease which appears in all breeds; it is non-contagious and is an inflammatory condition of the cutaneous membrane indicated by redness, swelling, nodules, pustules, fissures, scabs, and crusts, which are generally accompanied with more or less itching. In the first stages development of a hyperæmia is seen, thus reddening the skin superficially, and accompanied by a serous exudation. If the inflammatory irritation stops, or if proper therapeutic measures are taken, recovery may occur at once, and we have a more or less prolonged desquamation of the epidermis. In the majority of cases, however, the irritation increases and we find the formation of numerous pale red, tough, itching nodules, accompanied by serous swellings and slight cellular infiltration of the papillæ, but generally it is connected with the cutaneous follicles. This condition may become retrogressive; the nodules become depressed, forming scabs. In other cases the serous exudation increases constantly inside the papule, and, as a consequence, we have a rising of the external cutis in these locations; or, in other words, numerous vesicles are formed (eczema vesiculosum). If the external cutis is strong enough to resist the accumulated exudation for some time, the contents of the vesicles gradually become milky and pus-like, on account of the entrance of colorless blood-cells into the tissues (eczema pustulosum).

In other cases the vesicles burst or are scratched open; the skin is dark red in large blotches, and is marked by fine furrows which correspond with the location of the ruptured vesicles. The eczematous exudation oozes freely out of the upper surface (eczema rubrum). It is a common occurrence to see the detachment of small portions of tissue which are located between the numerous furrows in the epidermis. Thus the whole surface of the skin is stripped of its horny layer and may become filled with pus. The oozing liquid dries rapidly and becomes a scab or crust (eczema impetiginosum), which is pushed away gradually by the consecutive exudation, and finally becomes hard, dry, and firm. Inflammation and swelling become gradually lessened under the crust, and we have the formation of a firm epidermic cover, from which the crusts gradually become detached. The diseased membrane, which is now exposed, is not swollen to any great extent, but very red (sometimes marked with dark, livid pigmentations) and covered with numerous loose scabs which constantly fall off and are renewed from time to time (eczema squamosum).

Etiology.—The etiology of eczema is of great importance for establishing the correct prognosis, as no cure can be obtained until after the cause of the trouble is removed. The first thing we must do is to lessen the mechanical irritations, such as appear under the collar and on the testicles. But the lesions which the patient inflicts upon himself are of very much more importance, for we see it in all forms of itching eruptions of the skin, in erythema, in cases of parasites of the cutaneous membrane—flies, lice, acari—in great accumulations of dirt, scabs, and falling out of the hair. We also find attacks of eczema which extend very fast, and in some cases may go all over the body.

As regards the second group of agents which cause eczema, they are chemical irritants, especially those which have an influence upon the tissues, such as acids, alkalies, mixtures of mercury, also tar and carbolic salves, combinations of ether and oil of turpentine, of mustard, and also tar-soap (pus, urine, feces, saliva, etc.).

The third group is formed by a number of thermic irritations, namely, excessive high temperature, but not high enough to produce vesicles.

Eczema appears more frequently in summer than in winter, and we have a great deal more difficulty in healing it during the summer weather. We also have a number of eczematous formations for which we can find no cause. In these cases certain ill-defined irritating elements of the blood have been suspected. There being no sensible perspiration in the dog certain excretory or waste products are supposed to be retained in the skin (under certain conditions) and give rise to inflammatory processes. Nervous influences, vegetable parasites, abnormal fermentative, and decomposition processes in the intestine, have likewise been suspected while positive knowledge to this effect is still lacking. There is no doubt that various fermentative and toxic processes occurring in the intestinal tract are factors in the production of eczema rubrum, and that dogs have the disease anually, and associated with constipation. Eppinger contends that too much meat is not the actual cause as he has cases where the animal has had moist itching eczema and treated the animal with various drugs without result, and finally gave the animal a meat diet, and in two weeks the animal was entirely recovered. This, however, must have been an individual case as experience is that a strong meat diet is invariably one of the causes of this disease.

Clinical Symptoms and Course.—Eczema may appear in any breed of dogs and in any region of the body without regard to age, sex, etc. It is usually seen on certain regions of the body (back, head, neck, and external surface of the extremities).

Notwithstanding the extraordinary diversity and changeable character of the symptoms of eczema, three distinct forms, or types, are recognized.

(1) **Acute or Moist Eczema.**—This may develop year after year at any season and in dogs of all breeds. The longer haired dogs seem, however, to be more liable to it. It affects certain localities of the body more than others—the neck, jaws, elbow, on the back anterior to the tail, and the outside of the thigh. The first type is restricted to small, irregularly circumscribed regions, but has a tendency to extend to the neighboring tissues. The eruption begins as eczema papulosum with close nodules. The skin becomes red in irregularly circular patches varying in size from a quarter (shilling) to the palm of the hand (Fig. 214) ; there is increased heat and the skin thickens, the hair stands up, and soon a number of small vesicles are seen, which burst and discharge a pale yellow viscid fluid, and in from twelve to twenty-four hours there is partial or complete loss of hair. This rapidly changes into the vesicular form by alteration of the nodule, and finally we see the appearance of the median stage. This has a more or less extended surface without skin or hair, and shows a bright red, serous, sero-fibrinous or purulent exudate, very painful

to the touch, and having a great tendency to extend to the adjacent tissues (phagedenic scab). The stage of crustation follows very slowly; the exudate dries, forming a yellow-green to brownish crust which is firmly fixed to the skin and if not rubbed by the animal forms a thick scab that may fall off in a few days, but generally it is two or sometimes three weeks before it finally comes off, leaving a glossy, hairless, deep red or pigmented surface, with more or less gray scales. The surface soon becomes covered with fine hair, which soon grows very rapidly, covering the spot very quickly. This termination is frequently altered by the animal scratching, biting or gnawing the itchy surface, particularly when the sore is on the side where the animal can scratch it with the hind legs, or on the thighs or back where he can bite it. In rare instances the animal may so lacerate the affected portion as to cause permanent loss of hair. The course of this disease depends on whether it is treated early, for if neglected its course is apt to be slow or it is apt to degenerate into the chronic form, particularly in older animals.

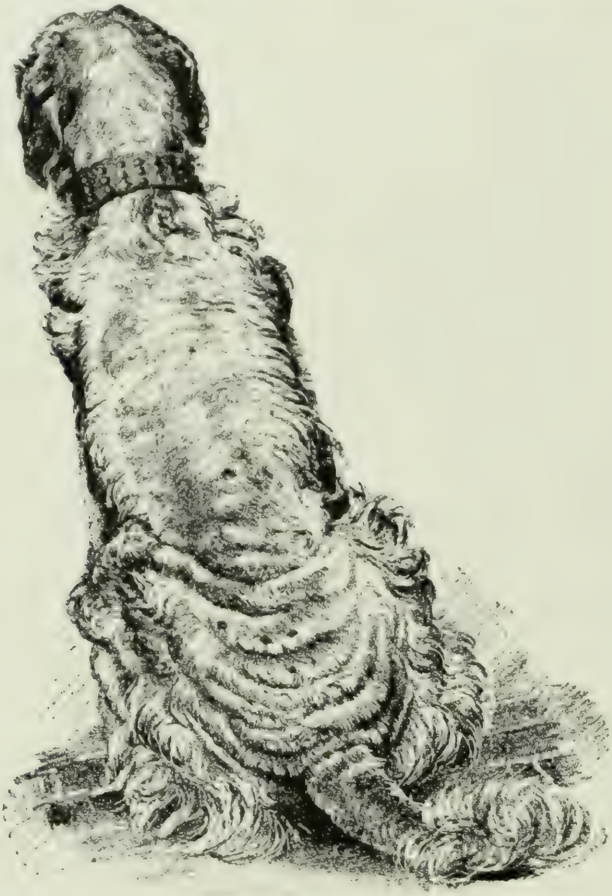


FIG. 215.—Chronic eczema of the back.

(2) **Chronic Eczema. Dry Eczema. Scab Mange.**—The second type

shows from the beginning an inclination to extend. In is generally observed in sluggish, well nourished dogs, and while it may occur in all breeds of dogs, it is more apt to be seen in short-haired dogs. It commences on the back at the root of the tail and extends gradually up the centre of the back, each succeeding attack going a little further forward until it finally reaches the neck. It is sometimes observed at the base of the ear, around the anus and the extremities; the scrotum is also a seat of the disease, and in exceptional cases the entire body is attacked (general eczema).

In the early stages we see it as eczema erythematosum with formation of scattered papules. These are scratched open on account of the great itching they cause, or they become altered into pustules. Later we see the appearance of small scabs under which regeneration of the epidermis occurs, the hair falls off or frequently long solitary hairs are found, the skin is thickened, developing wrinkles, crevices which frequently are raw, and the surface dull, lead colored, "elephant hide" in appearance (Fig. 215). In the other regions desquamation of the epidermis follows, particularly in summer; the animal, from the intense itching, scratches and tears the skin, converting the entire surface into a raw bleeding space with spots of pigmentation. There is more or less itching, but the irritation is not nearly so great as in sarcoptic mange, and is limited to the affected skin.

In chronic eczema the condition gradually creeps up the back, becoming broader and assumes a dull dark lead colored "elephant hide" look, with long unhealthy hairs here and there, or else this condition may prevail during the summer months, defying all forms of treatment, and when the cool autumn months come the irritation gradually subsides, the hair begins to return, becomes thick and normal by January or February and remains so until July or August comes, and the condition returns.

The following is a list of remedies useful in eczematous eruptions:

Ichthyol ointment, 2 to 5 per cent., with equal parts of lanolin and cosmoline.

Ichthyol tar-soap moistened and rubbed on the itching parts and allowed to dry.

Permanganate of potash solution of the strength of 1 to 3 per cent. where the skin is peculiarly irritable.

Where the surfaces are widespread and moist, dust with equal parts of talcum, lycopodium, and boric acid.

For use in the house on pet-dogs that have the range of the parlor and lounge on the rugs and furniture, try a 15 per cent. solution of hyposulphite of soda.

Creolin baths of the strength of 5 per cent. will give very great relief for many hours.

In the finer toy varieties, try a 1 per cent. solution of trikresol; ten grains of boric acid to the ounce of this solution adds to its efficacy in some cases.

Chloro-naphtholeum, two ounces to the gallon of water, is a useful medicated bath for the large varieties of dogs, and is destructive to parasitic forms of life.

Trikresol soap is far safer and better than carbolic acid soap for bath purposes when washing dogs frequently.

Do not use bichloride of mercury solutions in moist eczema.

Starch and oxide of zinc may be used separately or in combination as a dusting-powder alone, or after any of the watery solutions and tend to hasten healing of broken or denuded parts.

In chronic and long-standing cases, where fissures of the skin have formed and the animal tends to bite the affected parts, causing bleeding, touch them a few times with Monsel's solution of iron, and then use one of the powders.

For softening the parts, equal portions of lanolin and pure cosmoline, with ten per cent of boric acid, will be found useful and cleansing.

(3) **Itching of the Skin without Presence of Nodule Formation.**—This condition may extend over the entire body or it may be limited to the back or abdomen. or the internal surface of the thigh. Frequently there is intense itching, with little or no evidence of change in the skin. The skin appears red in some cases with only the slightest evidence of papules. In some cases the animal will scratch constantly, and at night the itching is apt to be particularly violent (this is seen generally in animals that are particularly well fed, house pets that are bathed often). They scratch their sides with the paws, bite different portions of their anatomy with the teeth, and rub under or against furniture until there is great irritation of the skin. A condition frequently mistaken for the above but not so unyielding to treatment is often seen in dogs that have been clipped, and the short stubby hairs sticking in the folds of the skin cause great irritation, but in this condition, while the itching is intense just after the animal is clipped, in a short time the hair grows and, becoming more flexible, does not cause irritation and the itching soon disappears.

Seborrhœic Eczema. Eczema Seborrhœicum.—This generally originates from a seborrhœa sicca; it may be local or general, and is distinguished by a number of eczematous calculæ or oval disks which are either solitary or in groups, each elevation being clearly outlined from the other. There is no itching, as a rule, and if there is, it is insignificant.

Eczema of the Toes. Interdigital Eczema.—Eczema between the toes is quite common. It is apt to occur in well-fed, well-taken-care-of house pets, and also a certain number of cases originate from actual external influences, such as sporting dogs in the field working through stubble, short grass and weeds; generally, however, it is due to good feeding and want of exercise, and may occur in any of the various forms—eczema vasculosum, eczema medidans, or eczema pustulosum.

Therapeutic Treatment.—In the treatment of eczema we must consider the following facts:

(a) There is no known specific that is useful in all forms of eczema and extensive experience is necessary to enable the practitioner to select the most effective remedy for any particular case. That in many cases the tar preparations which have been used almost exclusively are very harmful, as is also the method of systematically washing the animal with strong alkaline or carbolic soaps. The first thing to do is to give attention to the causes and find out from what cause the itching really occurs, as many cases of eczema disappear as soon as the irritation has been suppressed.

We must first remove any cause of irritation that would tend to aggravate the condition—such as dust, scales off dandruff, parasites—or anything that would tend to prolong the condition. Filthiness of the skin and hair must be removed by bathing the animal thoroughly, taking care to use a clean superfatted soap that does not contain too much alkali, and particularly avoid various soaps that contain crude carbolic acid or the irritating coal-tar products, so frequently seen in the "dog soaps" sold. It must be borne in mind, however, that too frequent bathing is apt to act as an irritant in eczema and while it should be used to remove dirt, it must not be used frequently, but as an actual necessity. In acute squamous eczema, the irritated spots can be dried up by pressing absorbent cotton on the sore, which has been saturated with carbolized oil, lime water, boracic acid solution, creolin solution, acetate of alum, or thiol mixed with corn starch. In the acute form of eczema the hair should be clipped not only over the affected parts, but also cut a clear space in the tissues surrounding the sore. Excessive scratching must be avoided by putting on muzzles, bandages or covers over the body, or chamois boots on the hind legs, etc. Finally, care must be taken to prevent the animal licking off the medicine, which may either act as an intestinal irritant, or actually poison the animal; with the addition of muzzles, the means already mentioned should be employed.

We dust the affected parts with oxide of zinc, cerussa, sulphur, or thiol, talcum powder, corn starch, magnesia containing bismuth subnitrate, dermatol; salicylic acid in talcum powder is particularly useful. If the affected parts are very moist, they may be dusted with lycopodium or smeared with vaseline.

In cases of extensive redness of the skin we must apply compresses of lead-water or thymol (1 per cent.), creolin (1 to 2 per cent.), carbolic-acid water, thiol water (20 per cent. thiol liquid, 30 per cent. glycerine, and 50 per cent. water); and where the skin is dry, an ointment of sulphate of lime, or sugar of lead in lanolin, dermatol (1 to 5) or tannin (1 to 10); but powdering is preferable as every skin is not benefited by liquid or oily preparations in the early stages. As soon as the marked symptoms of the disease have decreased we may replace the use of powder by ointments of zinc or lead, white precipitate ointment, or cold cream, lanolin, benzoin and glycerine, and benzoin and lanolin, 1 to 30, or use mild ichthyol soaps.

(*b*) In very moist eczema with an acute course the use of powder is not always successful. In those cases we must apply drying fluids, such as corrosive sublimate solution (1 to 1000), nitrate of silver solution (2 per cent.), 1 per cent. solution of picric acid twice daily by means of a brush or cotton tampon, and at the same time use the powders already mentioned in conjunction with these liquids. Great care must be taken when using the sublimate to avoid poisoning, also the application of both nitrate of silver and picric acid are apt to leave more or less black or yellow stain on the skin. Oxide of zinc and sugar are recommended by Bissauge, to be dusted on several times daily. Sublimate ointments (1 per cent.) or subiodide of mercury (2 per cent.) are beneficial, but strong solutions of blue-stone or crude sulphate of iron and tormentilla root are not to be recommended.

℞.	Hydrarg. bichlorid.,	1.0
	Glycerinum,	10.0
	Spts. vini rect.,	90.0

F. M.
Sig.—To apply upon eczematous surfaces.

℞.	Zinc oxide,	5.0
	Amyl. pulv.,	
	Talc,	āā 10.0

F. M.
Sig.—Dusting powder.

℞.	Bismuth subgallate,	3.0
	Talc,	20.0

F. M.
Sig.—Dusting powder for moist eczema.

℞	Argent. nitric	1.0
	Spirit.	50.0

M. D. S.—Apply with brush.

(*c*) In cases of pustula we may use the same treatment as is indicated in *b*, after having pressed out and emptied the pustules. The writer has also obtained good results with ichthyol liniment and salicylic ointment (see Acne).

(*d*) In chronic eczema, when it has reached the scaly stage, we must first clean the skin thoroughly with some mild, non-irritating soap, but not carbolic or tar soap. The best kind to use is Castile, ivory, green German soap, or the pure potash soap of the Pharmacopœia. The writer has had good results from "Hebra's" alcoholic potash soap:

℞.	Saponis kalin. venal.,	200.0
	Alcohol,	100.0

Hebra's soap is poured or rubbed upon the surface which is thickly covered with crusts, and on the following day they are removed easily without subjecting the animal to much pain. After careful cleansing we use the same agents as are used in the moist forms of eczema—zinc powder, corrosive sublimate, or nitrate of silver.

(*e*) In chronic eczema, we use tar and ichthyol and resorcin. The first is used either in the form of solutions of tar or combinations with oils. These preparations are used with good results in the chronic forms of eczema where there is considerable cutaneous thickening, with cracks, fissures, etc. Ichthyol is especially useful, and when used in concentrated form in ointments or liniments, it is much more valuable than tar preparations, because it relieves the itching or irritation in a very short time. Its high price bars its use to a certain extent when it is to be used in a kennel of dogs. Resorcin is also used in spiritous solutions. It has the disadvantage of staining the hair of light colored animals yellowish- or brownish-green, which takes a long time to wear off. In chronic cases, alcoholic preparations of benzoin, 1 to 30, are very useful, to be well rubbed into the skin daily.

℞.	Oleum picis,	3.0
	Spts. vini rect.,	2.0
	Ether sulphuric,	1.0

F. M. S.—Rub into the parts every third day.

℞.	Picis liquidæ,	
	Saponis kalin. venal,	
	Spirit dilut.,	āā 50.0

Sig.—Apply once daily.

℞. Creolin,
Sapo kalin venal, āā 100.0
Spts. vini rect., 50.0
F. M.
Sig.—Rubbed in daily. (Frohner.)

℞ Ammon. sulfo-ichthyolic, 10.0
Aqua calcariæ,
Oleum olivarum, āā 50.0

℞. Ammon. sulfo-ichthyolic, 12.0
Aqua calcariæ,
Oleum olivarum, āā 60.0
Sig.—Apply upon the thickened membrane once daily. (Frohner.)

℞. Resorcin, 3.0
Spts. vini rect. dil., 120.0
F. M.
Sig.—Rub into skin daily.

℞. Acid salicylic, 5.0
Ol. Fusci, 25.0
Sapo. viridi, 150.0
Sig.—Soap for chronic seborrhœic eczema.

℞. Acid salicylic, 3.0
Ol. olivæ, 100.0
F. M.
Sig.—Rubbed into the skin daily.

℞ Liq. kali. arsenicos 5.0
Aq. cinnamoni 15.0
M. D. S.—Ten drops twice a day and gradually increase to double dose.

That form of eczema described under the head of itching of the skin without the presence of papules generally resists treatment. Frequent bathing with the various strong soaps, sold as "dog soaps" containing active irritants, such as tar, crude carbolic acid, and various other chemicals supposed to destroy fleas, tends to irritate the skin and increase the itching. First, the blood which is generally too rich from overfeeding, or too little exercised, must be purified by the internal administration of salines, such as a tablespoonful of saturated solution of sulphate of soda (glauber salts), once daily, or the same amount of Hunyadi or Apenta water, and when the animal is bathed it must be with the mild superfatted soap, containing little alkali and some soothing preparation, such as benzoin or ichthyol. Frequently bathing has been found to aggravate the condition. The animal should be rubbed daily with bay rum, spirits of camphor, or benzoin, 3 parts, lanolin 1, and alcohol 2 parts, or salicylic acid and alcohol (1 to 30), or resorcin and lanolin (1 to 50), and internally the regular adminstration of some of the arsenical combinations—sulphuret of arsenic, 1-200, Fowler's or Donovan's solution, in 1-, 2-, or 3-drop doses. These arsenical preparations must be always given in the food, for when given on an empty stomach are very apt to cause vomiting; at the same time the animal must be exercised, the amount of meat must be lessened to a minimum, and the diet be soups containing vegetables and stale hard bread or toast.

(*f*) If there is considerable thickening of the skin, and if the latter is covered at the same time with scabs, we can obtain good results by rubbing salicylic oil (1 part salicylic acid in 35 parts of warm olive oil) over it daily for a week. If this does not succeed, which, however, is very rare, we must first use tar or ichthyol preparations and follow it up by the other. Some authors advise friction with soft soap, chrysarobin ointment, or naphthalin, and washing with potash.

For internal treatment, use saline laxatives, and where there is general disorder of the digestive tract, such as gastro-intestinal catarrh, constipation, or fœtid black stools, regulate the diet, put the animal on a mixed vegetable and meat diet, and two meals daily. The amount should be just as small as possible until the animal regains his appetite; in fact wait until he is ready to eat every meal when it is offered, before putting him back on his regular food. Yeast preparations, such as brewer's or baker's yeast, are recommended on account of their properties for stimulating the intestines.

Administer arsenic in the form of red sulphuret, 1–200 grain, or Fowler's or Donovan's solution, 1, 2 or 3 drops *in the food* twice daily. The theory that the gradual increase of the dose of arsenic until you have reached the point where the physiological effects were beginning to show on the teeth, vomiting, etc., is an error. Small regular doses continued over some time is the best mode of treatment. Care must be taken, however, not to start on too large a dose.

Acne. Furunculosis.

Under the name of "acne" we mean an inflammation of the hair-follicles and sebaceous glands resulting in suppuration. This form of skin disease is not produced, however, by follicular acari. This condition is classed as folliculitis or perifolliculitis, and in the dog is regarded as a rather grave condition, as the various follicles in the dog are frequently connected by one common follicular duct, particularly in the hair bulbs where they have a very complex arrangement with the sebaceous glands, and the irritation of one duct involves the whole hair bulb and sebaceous gland, causing extensive elevations, painful nodules, or dark bluish-red tumefactions (furuncle, dermatitis furunculosa).

This condition generally appears on the nose, cheek, side of the face, external fasciæ of the extremities, between the toes, and in some cases over the entire body.

Etiology.—Very little is known of the actual cause of this disease Local irritations have been thought to be the cause, such as constant pressure of the muzzle, licking or rubbing the affected parts, and in certain cases to some hereditary predisposition due to alteration in the character of the sebaceous glands, to waste products or pus that breaks down and tends to encourage the growth of bacteria which invade the hair-follicles and sebaceous glands. Dogs affected with chronic constipation are more liable to have acne.

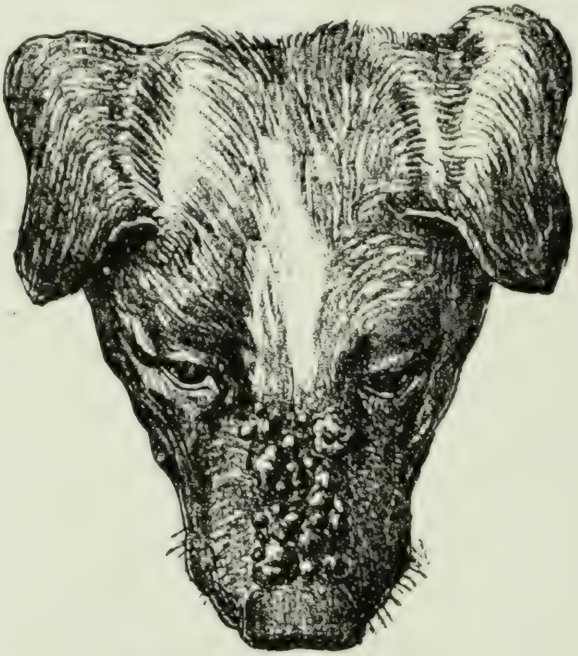


FIG. 216.—Acne of the nose.

Clinical Symptoms and Prognosis.—This disease which seems to attack certain portions of the body more than others, particularly on the skin of the snout between the stop to the nostril (Fig. 216), cheeks, side of the skull, and between the toes; more rarely on the outside of the legs, and in exceptionally rare instances it extends all over the body, develops very slowly, beginning with redness and loss of the skin and hair. It is indicated by a series of red spots which are painful, irregular, swollen, and extend over the surface the size of a dollar to the palm of the hand. These spots are caused by the formation of a large number of pea-like nodules (or larger) which are hard and firm. In some cases we find the whole surface of the skin red, hard, and very painful to the touch. After a short time the nodules become soft, discharge spontaneously a more or lesser amount of bloody pus, and contain in some cases cores of necrotic tissue.

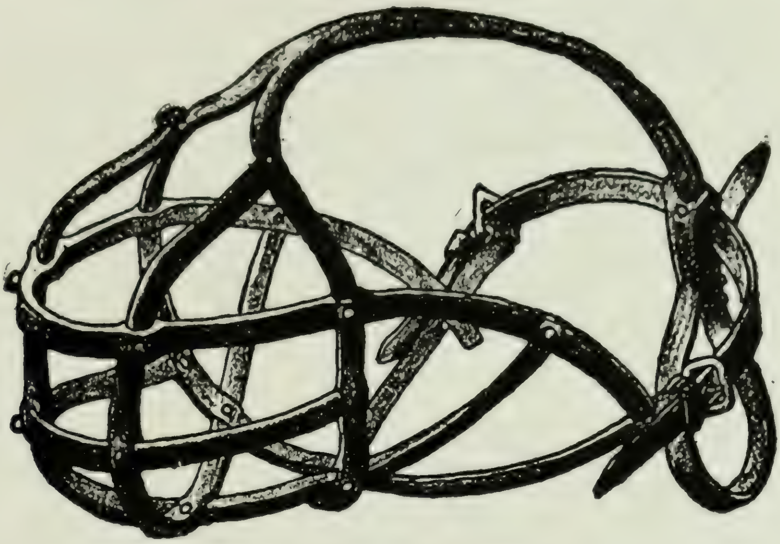


Fig. 217.—Acne muzzle.

Occasionally we see the coalescence of a number of these acne nodules, so that the skin presents a bluish-red discoloration and becomes purulent or sometimes necrosed, as if the skin was undermined by purulent collections. This may appear all over the body.

This "non-acarian" acne often presents symptoms similar to the parasitic acne (dermodectic mange) and in every instance it is always well to make a careful microscopical examination of some of the pus squeezed out of nodules to see if any of the acari are present. It has a great tendency to extend in almost all directions, and the cicatrices which appear after healing of the disease leave bare spots in different parts of the body, pink in color, streaked with lines of black pigment deposits.

Therapeutic Treatment.—Treatment must above all be thorough and energetic and consists first, in the removal of any known cause of the disorder—when the disease is located on the nose, which is one of the commonest locations of the disorder, due to pressure of the muzzle, the accompanying figure shows a muzzle recently put on the market (Fig. 217), which obviates the pressure on the nose, the ordinary nose strap being replaced by a smooth metallic arch. The ordinary muzzle can be covered by rawhide, leather or wadding or, better still, the portion toward the nose faced with patent leather. The treatment consists in the energetic local application of various external preparations. If the acneous nodules are in the early part of their development, we must puncture them or open the follicles by some strong antiseptic, such as salicylic or balsam of peru ointment, creolin, carbolic acid, resorcin. In cases where purulent disintegration has gone on it is advisable to open the pustules. This is best performed by means of a small bistoury or short strong needle. and then fill in the opening with iodine or paint it with disinfecting solutions, such as pyroktanin solution (1 to 10 of alcohol), or a 1 to 1000 solution of corrosive sublimate, compound tincture of benzoin, or dusted with boracic acid, or bismuth-formic-iodide, chloride of iron, tinc. iod. This should be used once a day when the acne is developing.

℞.	Acid. salicylic,	20.0
	Oleum olivæ,	40.0
	Lanolin,	80.0

Sig.—Put a small portion on the parts once daily.

℞.	Naphthol,	10.0
	Sulphur sub.,	50.0
	Ung. petrolati,	
	Sapo. viridis,	āā 25.0

F. M.
Sig.—Apply daily.

℞	**Acid. salicylic.**	**10.0**
	Adip. lan. anhydric	**60.0**
	Glycerin	**30.0**

Sig.—Apply daily.

The following should be used when the pustules have been emptied:

℞.	Creolin,	1.0
	Acid. boraci,	30.0

F. M.
Sig.—Dusting powder.

Frohner advises curetting the cavities and the use of the creolin ointment just mentioned, and in some cases cauterization with nitrate of silver, or powdering with sulphonal and tannic acid. In cases of circumscribed acne it is advisable sometimes to cut out the diseased portion of the skin.

The scales or scurf must be removed daily, until the pus is cleared out and granulation has commenced, then encourage the formation of a scab by using one of the various antiseptic dusting powders or the daily painting of the part with compound tincture of benzoin, until a thick scab is formed which protects the sores while healing goes on.

Alopecia. Falling Out of the Hair.

By this term we mean a falling out of the hair which is not caused by actual disease of the hair. We make a distinction, however, between general alopecia and alopecia areata. The former is an extensive falling out of the hair, often recognized after serious disease and during the period of convalescence, as in the latter stages of gestation and during and after nursing a large litter. The latter is a symptom of bad nutritive condition (alopecia symptomatica), and is characterized in some cases by a circumscribed or rounded herpes; this may become confluent and is especially developed on the back, tail, and external fasciæ of the thighs. In both forms it is not rare to find the skin pigmented. Siedamgrotsky has proved that alopecia of the dog if circumscribed or diffuse, depends on the atrophic condition of the hair and infiltration of the upper cutaneous layers, and it is especially seen in dogs with silky, white or grayish hair. Black-tipped hair, if the body of the hair is gray, is also noticeable. This condition is very apt to be confounded with herpes, in the form of a trophoneurosis, either from a disturbance of the circulation, or the irritation of parasites.

It has been thought that certain forms of this disorder might be due to some specific microorganism, but it has not been as yet isolated and described. There is seen in two breeds, Pomeranians and Yorkshires, a peculiar condition due to atrophy of the hair bulbs, in which young dogs, rarely over six to eight months, changing from the puppy hair to the first coat, loose the hair gradually or it falls out in spots or large areas become bare, invariably one side of the body being in perfect symmetry with the other, leaving the animal permanently bald in the affected portions. It rarely covers over the entire body, but is seen in the hind quarters and body as far up as the anterior limbs. The skin is bluish-black, perfectly smooth, soft and pliable, with no signs of eruption. That it is due to some pathological change in the central spinal system is very evident as there is a perfect symmetry of the affected sides. It is evidently due to too close breeding, when the object is to get miniature animals, as it is only seen in these toy breeds. The discovery of the cause, if this is possible, and its removal are of first importance.

Therapeutic Treatment.—The treatment consists of washing with alcoholic soap, bay rum, benzoin and alcohol (1 to 30), and a diluted tincture of cantharides or balsam of Peru with alcohol (1 to 10), styrax liniment (1 to 10), or some of the various hair tonics recommended for man. In alopecia areata when it is possibly due to vegetable parasites, we should use the treatment recommended for favus and herpes. Internally, arsenic preparations and Yolin lime.

℞.	Tincture of cantharides,	5.0
	Balsam of Peru,	10.0
	Spts. vini rect.,	100.0

M. D. T.
Sig.—Hair tonic.

It is advisable in alopecia areata to use antiparasitic agents (since parasites may possibly be the cause), such as diluted tincture of iodine (Friedberger and Frohner), or an alcoholic salicylic acid (10 per cent). The principal therapeutic agents, however, are rubbing with a strong brush, increasing the nutrition of the skin, plenty of exercise, and, above all, patience.

Pruritus (Pruritus Cutaneus).—This is an anomaly of the skin (neurosis) in which there is intense itching without any apparent cause, either from parasites or visible anatomical alterations of the skin. In man a similar condition is observed in icterus, diabetes mellitus, chronic affection of the kidneys and intestinal tract; also from the administration of some medicinal substances or certain kinds of food. It is also seen in old age. Intense itching has been observed in rabies, from the presence of large numbers of intestinal parasites shown by anal itching (pruritus ani), in certain affections of the spinal cord, distemper, neuritis, disorders of nutrition, and in some instances no true cause can be found. Frequently old dogs that have been extremely healthy, suddenly begin to age rapidly and show intense itching of the skin. The treatment of these nervous conditions depends on finding the true cause of their origin, and treating these causes. Where it is due to unknown causes, consult the chapter under the head of itchiness of the skin without the formation of papules.

Prurigo (itching vesicles).—In man this term is applied to a disease appearing in very young children, usually beginning as a form of urticaria and characterized by the appearance of small intensely itching nodules on the extensor surfaces, especially of the lower extremities. In the further course of the malady there is thickening and pigmentation of the skin and enlargement of the lymphatic glands (prurigo bubo). As to the occurrence of this condition in dogs, Hoffmann states: It is a disease of the skin which appears at an early age. It is generally incurable. There is the formation of a rash which is intensely itchy. Sometimes we may find a prurigo exanthema which is indicated by the formation of numerous nodules, followed later on with pigmentation of the skin and tumefaction of the lymphatic glands (prurigo bubo). This disease, as a rule, appears only in young dogs, commencing with an eruption similar to urticaria. The treatment consists in thorough cleaning with mild sulphur soaps and sulphur, tar, and ichthyol ointments.

Seborrhœa (*Greasy Skin*).—This disease is characterized by an extraordinary secretion of the sebaceous glands. We find two forms, seborrhœa oleosa and seborrhœa sicca et pityroidis. These two forms may both be present in fat, overfed dogs. The **seborrhœa sicca** is especially found in long-haired dogs, like poodles, as an accompaniment of eczema. More rarely it is found following distemper. It appears behind the ears, on the neck, and at the root of the tail, from which locations it may gradually extend. The animals give off a slightly rancid or fœtid odor and are slightly itchy in the early stages. There may be a bran-like dandruff which increases in amount, later accompanied by desquamation of the external epithelium. The hair feels oily and unhealthy, imparting to the hand a peculiar, fœtid, unpleasant odor, characteristic of this disease. The hair gradually falls out, and the animal becomes bald. The treatment consists in bathing with strong sulphur soap, or soaps containing benzoin, and the application of salicylic and sulphur ointments.

Seborrhœa Oleosa.—This appears, as a rule, in the parts having the most hair, yet it may also be observed in the crural surface and folds. It frequently develops after distemper and is sometimes observed as a result of the irritation caused by acari. The skin feels as if it were oiled, and leaves the hand oily after having stroked the animal. Want of cleanliness may occasionally produce a modification of this condition.

Seborrhœa præputi has been described by Schindelka as appearing in dogs with very narrow contracted foreskins, and has no similarity or connection with phimosis. The preputial orifice continually discharges a fœtid, oily-like fluid, greenish in color, and has much more consistency than the discharge in blenorrhœa of the prepuce. The treatment consists in cleansing of the penis with an antiseptic soap and followed by dusting the affected parts with dermatol powder. If phimosis is present, the opening must be enlarged by an incision.

Pemphigus.—This appears in man as a result of a number of diseases, and is indicated by the appearance of a series of vesicles which reappear from time to time and are apt to become chronic. In one case observed by Frohner, a male poodle dog not yet a year old gradually lost flesh and became anæmic. His back and both sides of the body up to the scapula, as well as the upper part of the legs, were denuded of hair, and certain raw spots on the skin about 2 mm. deep, varying in size. They were light rose-red on the border, shiny red in the centre, smooth, glossy and slightly moist on the surface. On the neck and upper sections of the anterior limbs were a number of vesicles the size of a hazelnut covered with dirty brownish-green crusts. These vesicles gave out, when pressed, a yellowish-white pus. The head, tail and posterior parts of the legs were free from vesicles or spots. The appetite was very good, but the animal grew weaker and weaker, and finally was destroyed.

Impetigo.—This is a condition understood as an eruption of pus vesicles. It is noticed frequently in distemper, and has been observed in old bitches in an advanced state of gestation. Some of them are also afflicted with endometritis.

On the external portions of the anal organs, on the skin of the internal surface of the legs, and the mammary glands were a number of pustules the size of hemp-seed, filled with thick yellowish pus which dried, leaving a brown scab, followed by a gradual succession of new pustules at the periphery of the affected regions. There was also more or less general disturbance and fever. These cases, as a rule, make a favorable termination.

Canina Bubo.—Frohner describes a purulent follicular inflammation of the lips, with lymphangitis and lymphadenitis on the head. This he observed in young dogs. There was swelling of the skin on the face; the lips became covered with bluish elevations which upon pressure yielded a bloody purulent fluid.

The lymphatic glands of the larynx and the region of the larynx and the parotids became tumefied, swelling to the size of a pigeon's egg. One dog died of pyemia. Frick has seen a similar disease in an old dog, which he does not think was a specific condition, but due to an extensive eruption of acne pustules.

Noma.—Moeller compares this with the noma (water cancer) of children. It is a spontaneous gangrenous formation of the jaw, which is extremely rare in the dog. The affection is situated in the corner of the jaw. The gangrenous condition developed very rapidly, reaching the size of a dollar in a very few days. The skin is grayish-brown in color, exfoliates and can easily be lifted from the healthy tissue. The submaxillary lymphatic glands were tumefied; there was also fever and salivation. The condition finally healed, but only after the greater portion of the jaw had been lost, the wound healing from the periphery. The treatment consisted in the application of a thermo-cautery, followed by corrosive sublimate solutions, 1 to 3000, and the animal was fed by means of liquid nourishment, being unable, on account of the jaw, to pick up the food and chew it.

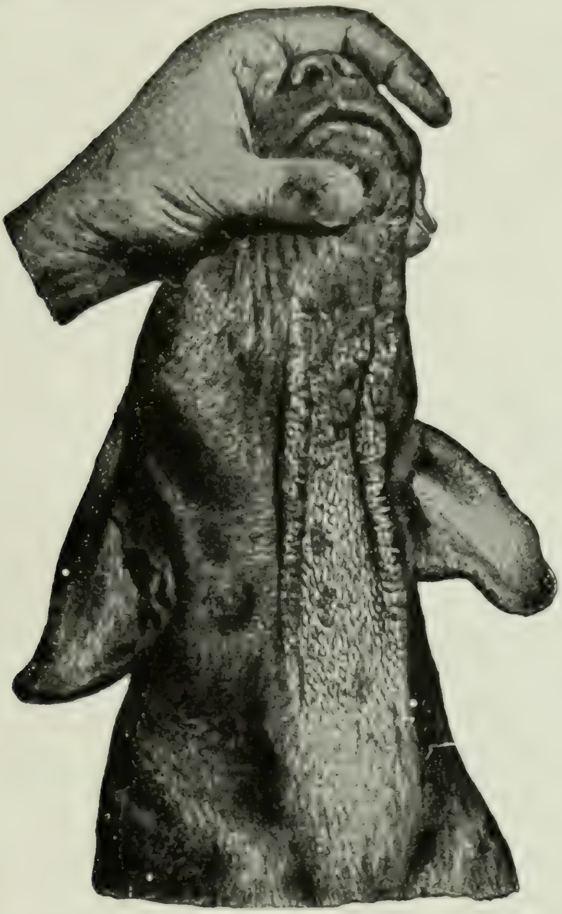


FIG. 218.—Acanthosis nigricans. (*Marek.*)

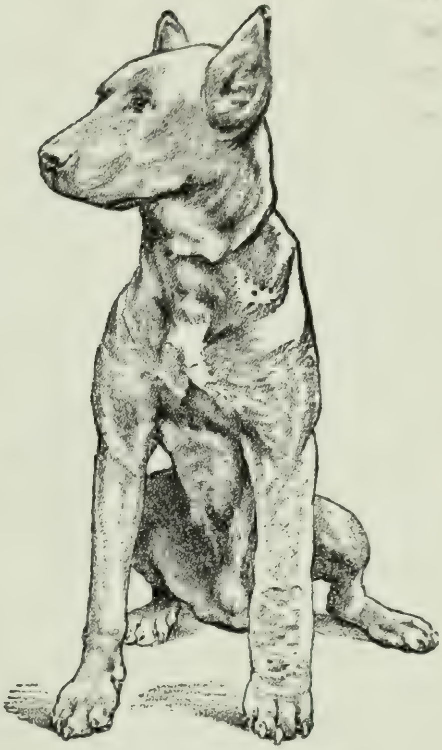


FIG. 219.—Pachydermia.

Acanthosis nigricans, Distrophia papillaris pigmentosa or Keratosis, s. Papillomatosis nigricans.—This is a hypertrophy of the papillary layer of the skin combined with an irregular proliferation of the horny layer of the epidermis and pigment formation, causing the skin to assume a brownish red, grayish brown or bluish gray, blackish color and an uneven tuberous or warty and sometimes grater-like surface (Fig. 218). Formerly this condition was usually described as **dermatitis verucosa** and considered as a sequela of erythema (which see). It develops on the less hairy regions which are exposed to repeated irritation as for instance the prepuce, anus, vulva, scrotum, teats, flexor surface of the knee, axillae, inside of concha of ear and occasionally on the mucous membranes of the eyelids, mouth and rectum. In mild cases it is sometimes possible to get good results by systematic massage with salicylic ointments. Large verucose proliferations should be treated like warts. Arsenic may be administered internally.

Pachydermia, Sclerodermia or Elephantiasis.—This is a so-called hypertrophy of the skin due to connective tissue proliferation concomitant with or a sequela to chronic or repeated inflammatory processes or venous stagnation and in rare cases develops without apparent cause. The case affecting the five-year-old dog illustrated in Fig. 203 seems to be of the latter class. The enlargement of the leg progressed without apparent cause and was characterized by remarkable firmness. X-ray examination showed that the bones were unaffected. Evidences of former lymphangitis or lymphadenitis were also absent. There was neither increased heat, lameness nor pain upon manipulation. Movements were only slightly stiff and awkward. Changes in the skin did not appear until the later stages, as a result of continued licking. Fibrolysin and massage seemed to effect slight reduction of the swelling. After this stage it became impossible for the author to make further observations. Other cases of pachydermia recorded in literature affect other regions of the body, viz., the head. Whether autogenous blood and serum treatment, as recently recommended, are really effective, is doubtful. At the best, such treatment would require a long time to bring about results.

Hundedruse (Dog Strangles).—Froehner applies this term to a purulent folliculitis of the lips followed with secondary PURULENT LYMPHANGITIS and LYMPHADENITIS, which he observed in young dogs. The facial region becomes swollen, bluish elevations which, upon pressure yield a bloody purulent mass, appear on the lips, the pharyngeal lymphatic glands and those of the parotid region become enlarged (sometimes to the size of a pigeon's egg) and form prominent elevations under the skin. In some cases death results from pyemia.

Mycosis fungoides.—This is a peculiar and rare skin affection of man characterized by the appearance of eczema-like patches, and fungus-like proliferations the size of a pea to that of a pigeon's egg. The latter may ulcerate or retrogress and leave pigmented surfaces or, in some cases be accompanied by swelling of the lymphatic glands. Schindelka, on a number of occasions, observed similar conditions in dogs. On the skin, which had for some time been eczematous, there was a development of painless excrescences, strawberry or raspberry-shaped, with tuberous or cleft surfaces and rose red, brownish red or bluish red color. One patient was cured by touching the affected areas with fuming nitric acid. A similar case, in an aged dog, is described by Wirth.

Cutaneous Affections Which are Caused by Animal Parasites.

The changes produced in the skin from disease caused by animal parasites are divided into two stages—primary and secondary.

The primary appears as a superficial inflammatory process, produced directly by irritations of the parasites upon the skin, and this condition depends to a large extent upon the amount of irritation and the depth that the parasites have penetrated.

The secondary symptoms are the result of this penetration into the cutis, causing more or less itching and irritation, and, as a rule, scratching and rubbing on the part of the animal, producing heat, redness, papules, vesicles, pustules, hemorrhages, or excoriations. These irritated spots may not be restricted entirely to the affected region in which the parasites are located, but may spread to other localities. This form, which is nothing more or less than eczema, possesses two peculiarities which may distinguish it at once from the common form of eczema which is not produced by a parasite:

1. It invariably appears in single, isolated eruptive spots, and it is only after the disease has been present for some time, or where there is extensive irritation, that we may find the surface connected together.

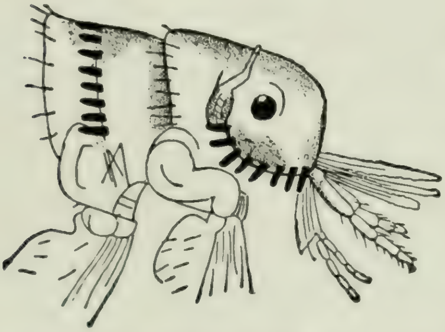


FIG. 220.—Head of dog flea (Pulex canis). (*Mégnin.*)

2. We see the appearance of these eczematous eruptions in certain locations which are especially preferred by the parasites, and showing their greatest development of the eruption in those regions, even when the whole body is affected.

A microscopical examination of the scales of the skin will furnish definite information as to the character of the cause of the eruption. We distinguish two groups of cutaneous parasites: First, those which live upon the external surface of the skin, and, second, those which enter the tissues of the membranes, penetrating deeply into the tissues. In the first group we have the following:

Ctenocephalus Canis, Pulex Canis, the Dog Flea.

The true dog flea, as well as the human flea (pulex irritans), is found in the dog. The former is distinguished from the latter not so much by its size but rather by the different length of its tarsal joints, and by the presence of a number of sharp hairs arranged in a comb-like layer along the side of the head (Fig. 220), where it joins the thorax. Coarse breeds of dogs are not particularly affected by the bites of fleas, but pet dogs and delicately bred animals scratch and rub to such an extent as to cause irritated splotches and redness over the entire body, and lead the owner to believe that the animal is affected with mange. The skin is also filled with the small brownish-black excrement of the flea. If the fleas are removed from the skin by a bath or in some other manner, we may relieve the itching and irritation by the application of some soothing solution.

Therapeutic Treatment.—Fleas are best removed by means of Persian insect powder (Flores pyrethri). This must be moistened with alcohol and rubbed into the hair. The animal must stand on a sheet of paper while this is being done, as the flea is not killed, but is only temporarily stupefied by the action of the drug, and falls on the paper. The paper with its contents must be burned. Another method is to take the dog out in a field away from the kennel and rub him thoroughly with spirits of camphor, and the fleas fall on the ground and soon die. The placing of cedar shavings, tan bark, walnut leaves or pine shavings, in dogs' kennels tend to keep away the parasites. Parsley seed and absinthe powder are also useful. In fine pet animals the daily rubbing into the skin of spirits of camphor drives away the fleas and the camphor left on the skin after the alcohol evaporates has a tendency to keep the fleas away. Rubbing with laurel oil, or a mild solution of creolin (2 per cent) may be tried, the latter, however, being apt to roughen the hair in soft-haired dogs. The blankets or cushions where the dog sleeps should occasionally be subjected to heat. The best plan is to put the blankets or cushions in an oven that is moderately warm, and leave them there for ten or fifteen minutes. This destroys the parasites and kills the germ in the eggs. In a kennel the washing of the floor with corrosive sublimate solution 1 to 300, or creolin 1 to 100, and allowing the solution to go down between the cracks where the eggs lie is particularly useful.

Pulex Penetrans, Sarcopsylla Penetrans (*Sand Flea*).—This is somewhat smaller than the dog flea and is found in America and since 1872 in certain parts of Africa. It lives in sand and on weeds. It lives on man as well as the dog, and while the mature male and virgin female cause little or no inconvenience, the pregnant female burrows into the skin, burrowing until the head is in the skin, leaving the body protruding. In a few days the body, in consequence of the development of numerous eggs, grows to an enormous size in proportion to its normal, sometimes getting as large as a pea (Fig. 221). It causes more or less itching while it is in the skin, and if the dog should gnaw and kill the insect, it is apt to act as an irritant, causing suppuration and in some cases necrosis of the skin. Great care must be used in removing these ticks; careless removal, as has just been said, causes irritation and abscess. Saturate a pad of cotton with chloroform or ether and lay it over the parasite which immediately liberates its holding hooks in the skin and falls off.

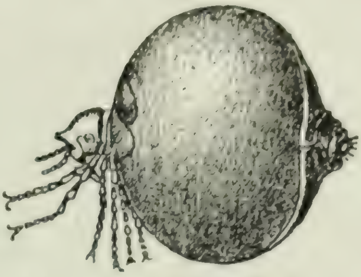


Fig. 221.—Female pulex penetrans greatly enlarged.

Hæmatopinus Piliferus (Dog Louse) and Trichodectes Latus.
(*Dog Parasites.*)

Hæmatopinus Piliferus, dog louse (true louse); **Trichodectes Latus,** hair louse or bird louse (so named because by far the greatest number of species inhabit the plumage of birds).

Characteristics of Hæmatopinus.—Head egg shaped with two antennae of five short joints each, beak sheath with retrorse hooklets at the tip, evertable sucking tube with two movable knifelike stilettos; thorax indistinctly segmented and three pairs of legs with shear-like claws; abdomen large, nine-segmented; length about 2 mm. (see Fig. 222).

Characteristics of Trichodectes.—General form or outline of body not unlike that of hæmatopinus but with broad almost square head, antennae three jointed and biting, pincer-like, mouth parts; thorax constricted and neck-like; abdomen distinctly nine-segmented. Length 1 to 22 mm. (Fig. 223).

The former parasites are the most disagreeable, as they suck the blood from the body, live particularly on those parts of the skin where the hair is thick and which are not exposed to the cold, such as the neck, flanks, and around the base of the tail. The trichodectes feed, as a rule, upon the hair and epidermis, and are found particularly on the head and neck. Both skin parasites produce intense irritation and rubbing, causing inflammatory efflorescences which look very much like squamous eczema, with partial loss of hair and formation of scabs. The diagnosis is usually easy, as we can see the parasites and their eggs by separating the hair.

Therapeutic Treatment.—This consists of destroying the parasites and their eggs. For that purpose it is often requisite to clip the animals. The safest and least harmful agents are decoctions of tobacco (5 to 10 per cent.), solutions of creolin (3 to 6 per cent.), petroleum (crude, or mixed with benzine, lysol or sapo-cresol), and in small dogs anise-seed oil (1 to 10 per cent. of olive oil). Mercurial ointment may be rubbed in the neck around the collar, but we must not apply more than a piece the size of a bean, as it is apt to cause salivation. Washing with corrosive sublimate solution has been tried, but it must be carefully done, as the same precaution has to be taken as with mercury ointment, the animal not being allowed to lick the body, as it is very apt to produce mercurial symptoms of salivation. Insect powder (pyrethrum), mixed with alcohol, can also be rubbed into the body.

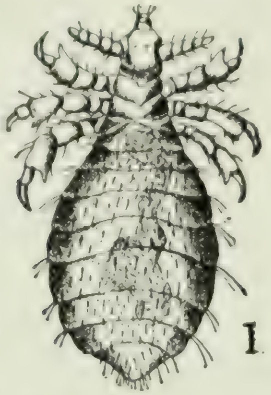


Fig. 222.
Hæmatopinus piliferus.

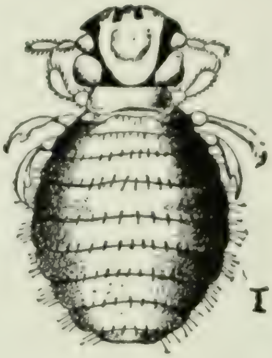


Fig. 223.
Trichodectes latus.

The accompanying small lines give the natural size of the parasite.

Ixodes Ricinus, wood tick.—This parasite, which is about 2 mm. in length, and sometimes when full grown almost 3 mm., looks very much like an acarus. It penetrates into the skin and sucks the blood, and is generally seen in setters or pointers, and dogs when working through the woods and underbrush become filled with them. Turpentine and petroleum will destroy them instantly, or, better still, a small quantity of chloroform or ether sprayed on the skin makes them loosen their hold immediately. They should never be forcibly pulled away from the skin as they leave the mandibles in the skin and cause great irritation and frequently an abscess.

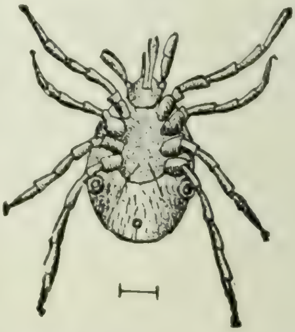


Fig. 224. — Ixodes ricinus. The accompanying line is the natural size of the parasite.

Leptus Autumnalis.—This is what is known as a "harvest bug" or acarus. It is about 4 mm. in length, and is the red larva of thrombidium holosericeum. While human beings are quite frequently affected with this parasite, it is only rarely found in the dog. Pustular inflammations of the skin of the dog are sometimes produced by this parasite. The rash was very prominent on the abdomen and the inner fascia of the legs, and was healed quickly by an application of carbolic acid and glycerine, or carbolated cosmoline.

Dermatophagus Canis.—This is very rarely found in the dog, and is a parasite which affects the ear, producing otitis externa. For further details refer to Parasitic Otitis.

Cimex lectularius; Bed bug.—Bed bugs will attack young dogs, and inhabit their "nests." The skin shows lesions produced by scratching, splotches, and firm, lightly pigmented nodules developing from the latter which contain small punctured wounds.

Maggots; Larvae of flies.—A condition corresponding to **warbles** in the ox is said to occur in dogs, occasionally (hunting and shepherd dogs). However, positive evidence and knowledge as to the nature of the fly in question, are lacking. The tumors (about the size of a hazelnut) which contain the supposed warbles, are said to be found in the region of the ears, on the neck and root of tail. Treatment would consist of incision, pressing out the parasite and applying disinfectants. Other species of flies, e. g., Hippobosca equina, Sarcophaga carnaria, Sarcophaga magnifica and the common house fly do not annoy healthy dogs to a serious degree. Sick dogs, however, may be seriously molested or affected by the deposit of eggs and larvae in the conjunctival sac, ear, genital organs, etc. A good remedy for keeping off flies is **oil of Laurel.**

Raillet describes a pathological condition caused by the larvae of Ochromyia anthropophaga in Senegal, that resembles the lesions produced by warbles. They appear in different parts of the body, ears, tail, paws, etc., are painful, develop rapidly, and discharge the mature larva in about a week.

Anguillulidae.—These are small filiform worms that infest the straw litter. They give rise to skin eruptions characterized by itching, loss of hair and pustule formation. In a case treated by Kuehnemann the cause was due to the species Rhabditis strongiloides. The trouble is readily controlled by observation of cleanliness and application of remedies effective for mange.

CUTANEOUS DISEASES DUE TO ANIMAL PARASITES.

Sarcoptes Scabiei, s. Squamiferus.

(Sarcoptic Mange; Scabies Sarcoptica.)

Sarcoptic mange (common mange, scab) is a disease of the skin which is very common, particularly where a large number of animals are together. It is accompanied by violent itching, and is due to the presence in the integument of the sarcoptes scabiei squamiferus, more rarely S. minor.

Description of Sarcoptes Scabiei.—This parasite is about 0.2 to 0.35 mm. broad and from 0.25 to 0.48 mm. long. It has a rounded, turtle-like shape and a horseshoe-shaped head, with well-developed club-shaped scissor-like vertical jaws. It has short rudimentary feet, and tulip-shaped suction cups which are attached to the first, second, and fourth pairs of feet in the male, while in the female they are found in the first and second pairs only. In the back we see six elongated acorn-shaped thorns, and four rows of 14 lance-shaped thorns on the upper surface of the back between the thorn scales in varying number. The skin shows transverse folds and we find four elongated bristles on the posterior end of the body (Fig. 225).

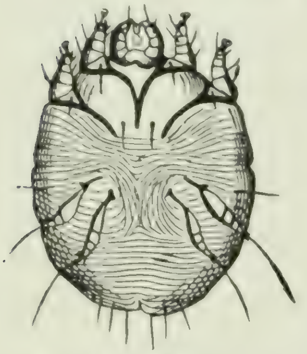


Fig. 225.—Female sarcoptes of the dog, magnified 75 times, giving the abdominal view. (*Siedamgrotzky.*)

The male acari and the young parasites generally inhabit cavities in the skin which they have made for themselves (Fig. 226). These cavities are connected externally by short ducts, the entrances of which may be marked by small vesicles or pustules, while the female may move to different parts of the body when sexually ripe, burrowing ducts through the upper layers of the epidermis down as far as the membrana Malpighii, which contains a great deal of fluid. At the upper end of the duct, that is, the place of entrance of the acari—we see the development of a small, somewhat moist nodule, or a vesicle, which dries up ultimately, leaving a scar. These ducts contain eggs and feces. This digging of the parasite may produce more or less separation of the epidermis. We generally find that the parasite has a preference for certain parts of the body, such as the head, concha of ear, neck, abdomen, and chest, at the root of the tail, and the paws. It is very hard to detect it with the microscope. The best way is to remove some of the membrane with a scissors or scrape the upper portion of the skin to the corium until it bleeds. This material should be boiled in 1 or 2% caustic potash solution and placed between two glass slides for examination under low power. If parasites have been present for some time, a secondary eczema is soon developed, which is produced by scratching and rubbing, also by itching of the scabs and scales. This "mange eczema" appears in various forms, according to the sensitiveness of the skin, and is either papular, vesicular, or pustular, and sooner or later produces decided thickness of the skin and leads to the formation of a number of folds, wrinkles, and ulcerated points between the clefts of the wrinkles. There is always a certain characteristic appearance about these affected localities which makes it easy to distinguish between the parasitic and simple eczema. The surface finally becomes confluent, forming large eczematous areas. It is very improbable that a mistake will be made in diagnosis, except in the early stages, when there is only a very small spot affected, because the parasitic eczema produces rapid characteristic changes, accompanied by scratching, twitching, rubbing, and licking, which are very much aggravated as soon as the animal is placed near any warm object, for instance in the neighborhood of a stove or if covered up with a blanket, and also the evident pleasure which the animal gets if the affected part is rubbed or scratched, and finally, if the animal is kept with other dogs, the disease is carried to them and developed very quickly.

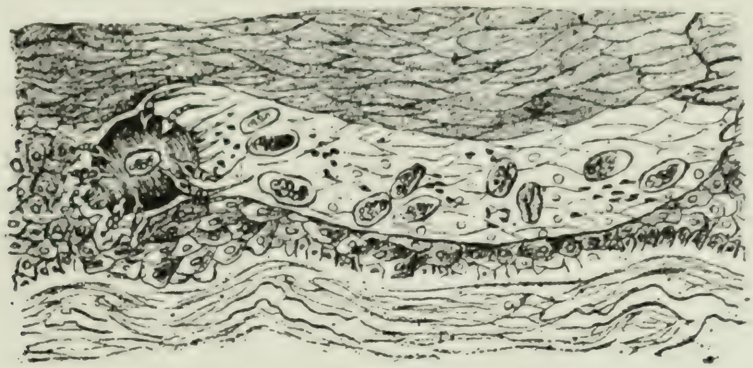


FIG. 226.—Female sarcoptes burrowing in the skin: also eggs and excrement.

In making a differential diagnosis between sarcoptic and follicular mange we may frequently find that in follicular mange the eruption may be very similar to sarcoptic, but the itching is very slight in follicular mange; in fact, in some cases of follicular mange scratching or rubbing an affected animal very frequently causes the animal pain, and there is rarely any pus in the pustules of sarcoptic mange, whereas in follicular mange the pustules contain pus and when squeezed out and examined under the microscope, the matter is filled with acari. Of course it is not impossible, not even a rare occurrence, to have both sarcoptic and follicular mange present in the same animal.

The prognosis is not unfavorable, as vigorous treatment usually cures an animal in a short time, provided the disease has not covered the whole body. If it has extended over the body in young animals, it may cause great emaciation, and in some cases great alteration of the skin, and if the animal is greatly run down, it is a question whether they can stand energetic treatment. When the parasites are destroyed, frequently we find an eczema follows that is very obstinate and it takes some time before the skin returns to its normal condition.

Therapeutic Treatment.—In order to produce good results in mange we must kill or remove the parasites, their larva and eggs, as the itching and scratching ceases as soon as they are destroyed, and naturally the artificial eczema also disappears rapidly. A large number of anti-parasitic agents are used—creolin, carbolic acid, coal-tar, anthracol perugen, ichthyol, sulphur, petro-sulphol, septoform, formaline. The preparations generally used are creosote, wood-tar, creolin, sulphol-cresol, styrax, and epicarin, lysol, salicylic acid, and Peruvian balsam. They are all useful, and may be applied according to the following directions:

It is always necessary to make a general application of the agent, even in such cases where the disease seems to be restricted to one region of the body. The dog must have the hair shaved off, if necessary; be covered all over with a layer of soft soap or with Hebra's alcoholic potash soap, which is to be shampooed into the skin with the hands or a stiff brush, and cleansed thoroughly in clear tepid water. The agent which is to be used is then applied with the hand or with a brush, covering only one-third of the body at a time, repeating the operation in two or three days. If the whole body is affected in spots, cover the whole body. A good general plan is to give one thorough application to the body, three days later another, then three days after that a third application, and three days after that the application may be removed by soft soap and water, then if the animal is at all suspicious repeat the whole cycle a second time. The best ointments for mange are:

1. Pix liquida, sapo potassii viridis, spiritus vini rect., equal parts, q. s. Ft. linimentum.

2. Creolin, sapo potassii viridis, of each 1 part; spiritus vini rect., 10 parts.

3. Creosoti, 1 part; pix liquida, sapo viridis, spiritus vini rect., aqua, of each 8 parts.

4. Creolini (lysol bacillol, liq. cresolis saponat); petrolatum or lard, 12.

5. Two to 5 per cent. solution of creosote or carbolic acid in olive oil.

6. Peruvian balsam 1 part, spiritus vini rect. 3 parts.

7. Peruvian balsam 1, sapo viridis 1 part, spiritus vini rect. 5-10.

8. Styrax 2, alcohol 1, olive oil 2.

9. Sulphur sublimed, pix carolina each 3, creta preparata 2, sapo viridis, adeps, of each 6. (Wilkinson's ointment.)

10. Epicarin, oleum ricini, ether sulph. 1, alcohol 9.

The first five agents which are mentioned are very effective, but more or less dangerous, so it is advisable to use them in healthy or not too young or delicate animals, and if the animal is greatly depressed, no appetite, and has either slight convulsions or dark-colored urine (this is sometimes not observable until urine has been exposed to action of daylight for some time), or both, the preparation must be washed off immediately, and at the same time administer small quantities of sulphate of sodium in their drinking-water in order to prevent carbolic poisoning. Peruvian balsam is harmless and very useful, but, unfortunately, it is expensive, and is only adapted to very fine pet dogs. At the same time if it can be procured and it is not adulterated, it is by far the cheapest in the end, as it is not dangerous and it can be applied liberally. The coal-tar products are always more or less dangerous on account of the ready absorption of such preparations. Styrax renders the hair very sticky. The solution of epicarin is used for very delicate house dogs in the early stages of the disease; the hair need not be shaved off when using this combination, and should be rubbed in thoroughly every third day. It is apt to sting and smart the animal and they may become greatly excited. During the treatment it is well to give strong nourishing food, and as the animals are either shaved or the body covered with an oily preparation, to keep them in warm houses or kennels.

Prevention Methods.—The owner of the dog must have his attention called to the fact that the sarcoptes are highly contagious, and may produce similar complications in other dogs and in man; and while this in man may be of a very mild character, it has been observed in the acute form in several cases.

The contact of many dogs with healthy animals must be prevented and covers, blankets, bedding, etc., which have been used by the affected animals must be subjected to a thorough cleansing by washing with hot solutions of soda and a high degree of heat. The straw, of course, must be burned.

FOLLICULAR MANGE. ACARUS MANGE. ACARIASIS.

Acarus s. Demodex Folliculorum.

Follicular mange is a very serious affection due to the presence of the acarus demodex folliculorum in the skin and particularly the hair-follicles. It differs from sarcoptic mange in that it is rarely itchy, and if so, only very slightly.

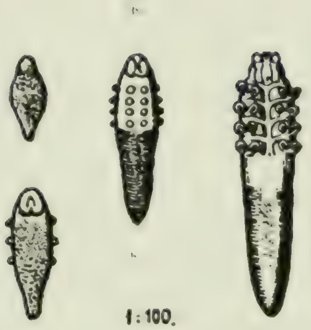


FIG. 227.

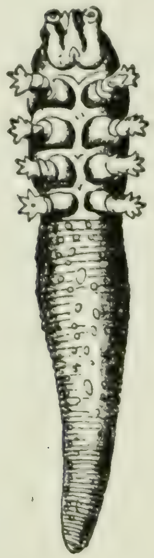


FIG. 228.

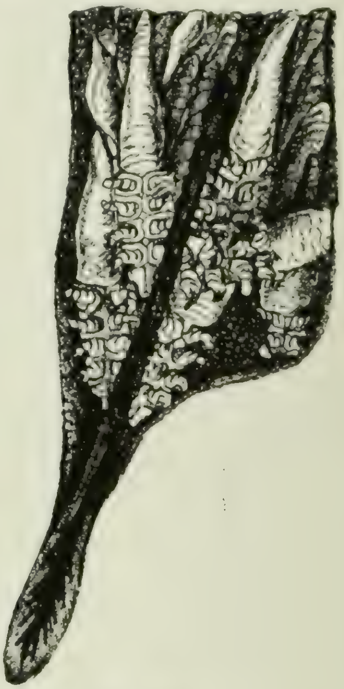


FIG. 229.

FIG. 227.—Development of the acarus folliculorum: Egg; six-legged larva; eight-legged larva, and developed larva.

FIG. 228.—Acarus folliculorum greatly magnified.

FIG. 229.—Hair-follicle invaded by demodectes folliculorum.

Characteristics of Acarus Folliculorum.—Length about 0.3 mm., width 0.045 mm., wormlike, lanceolate with lyrate or horseshoe-shaped head; the latter with shear-like masticatory apparatus, mobile proboscis, and triple-jointed maxillary antennae, elongated cone-shaped abdomen and eight triple-jointed stumpy feet attached to the thorax. The eggs are spindle-shaped. The larvae, when emerging from the latter, have the same general form as the fully-developed mites but have only six feet (see Fig. 227).

These parasites are found in the hair-follicles and sebaceous glands, their head toward the bottom of the sac, and the caudal end toward the external opening (Fig. 229). Their number may be large in a sebaceous gland, even as many as 150 have been found there. They generally average from 30-50. The larvæ and eggs often in great numbers lie beside the parasite. The irritation of the parasite causes the follicles and sebaceous glands to become dilated and the subsequent atrophy of the hair papilla causes falling out and permanent loss of hair and where there is a great number of parasites present, pus is produced from bacterial infection and a purulent inflammation of the perifollicular and periglandular tissue ensues, with the formation of pustules. The relapses, after the disease appears cured, may be due to temporarily encysted mites. It may be that these parasites may have been in some inaccessible place, such as the eye, ear, or prepuce. In very severe cases with numerous pustules of the sebaceous glands, death may occur from general septic infection. The sebaceous glands are also destroyed, causing acneous pustules. The demodex acne shows itself in certain preferred parts of the body, especially the head, throat, neck, and paws, but it may extend over the entire body. It is not very easily transmitted from one animal to another, as has been proven by the attempts made by Weiss, Martemucci, and others, who were unsuccessful. The writer had four dogs, two adults and two pups, and kept them for months with a bitch that was badly affected with acari, but failed to get any signs of transmission. When the animals have been experimentally inoculated Haubner reported a case in which twenty-four hours after inoculation there were all the marks of the disease and the sac contained eggs and larvæ. A second inoculation cured itself spontaneously. Other observers have had similar experiences. It seems that to propagate the disease the animal must have a certain predisposition, the nature of which has not been satisfactorily explained. Young dogs when exposed to infection seem to take it more readily than older dogs, but whether it is congenital is a question. The natural method of contagion is the contact of healthy dogs with diseased ones, but there is no doubt that some individuals are immune.

Clinical Symptoms and Course.—These are distinguished by a pustular and squamous form of eruption, but both forms are apt to be united in the same animal. The pustular form is much less common than it was 40 or 50 years ago. It may be recognized by the hair falling out, by hyperæmic and swollen skin, which becomes thickened and in folds, and red from lack of pigment, forming nodules often the size of millet seed, which change from bluish-red to yellow pustules, and finally the purulent bloody contents escape, and in it and under the membrane we find hundreds of acari.

The itching, as a rule, is never very great, as in sarcoptic mange, and in some cases not even present. When the affected cutaneous regions are scratched or rubbed, the patients, as a rule, resent it and do not derive the pleasure that scratching gives in sarcoptic mange. The disease spreads very slowly, the eruption starting at the head and between the toes, and in only very rare instances does it cover the whole body (see Plate). The parts that are affected finally heal, but the skin remains thick, denuded of hair, marked in some places by scars or cicatrices, and also by cracks and wrinkles. In some cases we may have a dark pigmentation marked with warty projections. When there is any itching present the appearance of the cutis may be changed materially by secondary eczema. The appetite is very rarely affected, the animal eating well, although some cases, in spite of good food, have shown the animal to have an impoverished, unhealthy look.

The squamous form is much more prevalent than the pustular form, and is seen in the neighborhood of the eyes, the bridge of the nose, forehead and the anterior surface of the neck (Fig. 230) and breast, but it may show itself in other parts of the body. It is an abnormal cutaneous inflammation accompanied by falling out of the hair and great accumulation of scabs, and isolated bare spots resembling alopecia areata. The hair drops from the affected places. The skin is only slightly reddened, but covered with thick scabs. If these places are squeezed, the parasites can be pushed out of the skin very rapidly. The easiest way to obtain the parasites is to rub the blunt end of a knife, previously dipped in oil, over the affected parts, and the microscope will aid you in distinguishing this disease from simple scaly eczema. In any suspicious bald spots on an animal, it is always well to scrape off a portion of the affected part and give it a close examination under the microscope. The pustular form seems to be much less frequently observed in the last few years. This form of the disease appears as a series of hard nodules in the skin, ranging in size from a millet seed to that of a pea, and when they appear in numbers they are apt to become confluent and merged into one nodular mass, and the tissue in the affected region assumes a reddish-blue color. On pressure of one of these nodular masses there exudes from it a purulent sanguineous fluid which, when examined under the microscope, is found to contain numerous dermodectic acari. After the nodules empty or are evacuated, the skin becomes covered with scales or crusts. The animal is not itchy in this condition, or if so it is in very slight degree, and not in any sense at all like the intense itchiness of sarcoptic mange; generally the animals when scratched or rubbed in the affected region evince pain and endeavor to get away. In case the animal should show a certain amount of itchiness it is not at all impossible that the animal may have sarcoptic mange as well as dermodectic even if all the symptoms of follicular disease are present. The pustular form of the disease seems to attack the head and neck more frequently than any other part of the body; that is, it commences there, as a rule, and gradually spreads from that point to other parts of the body. The disease goes through the phenomena of developing the nodules, accompanied by acute local inflammation of the skin. This is followed by purulent inflammation of the nodules and the discharge of a serous purulent or sanguineous fluid. The abscess gradually dries up and the skin as a

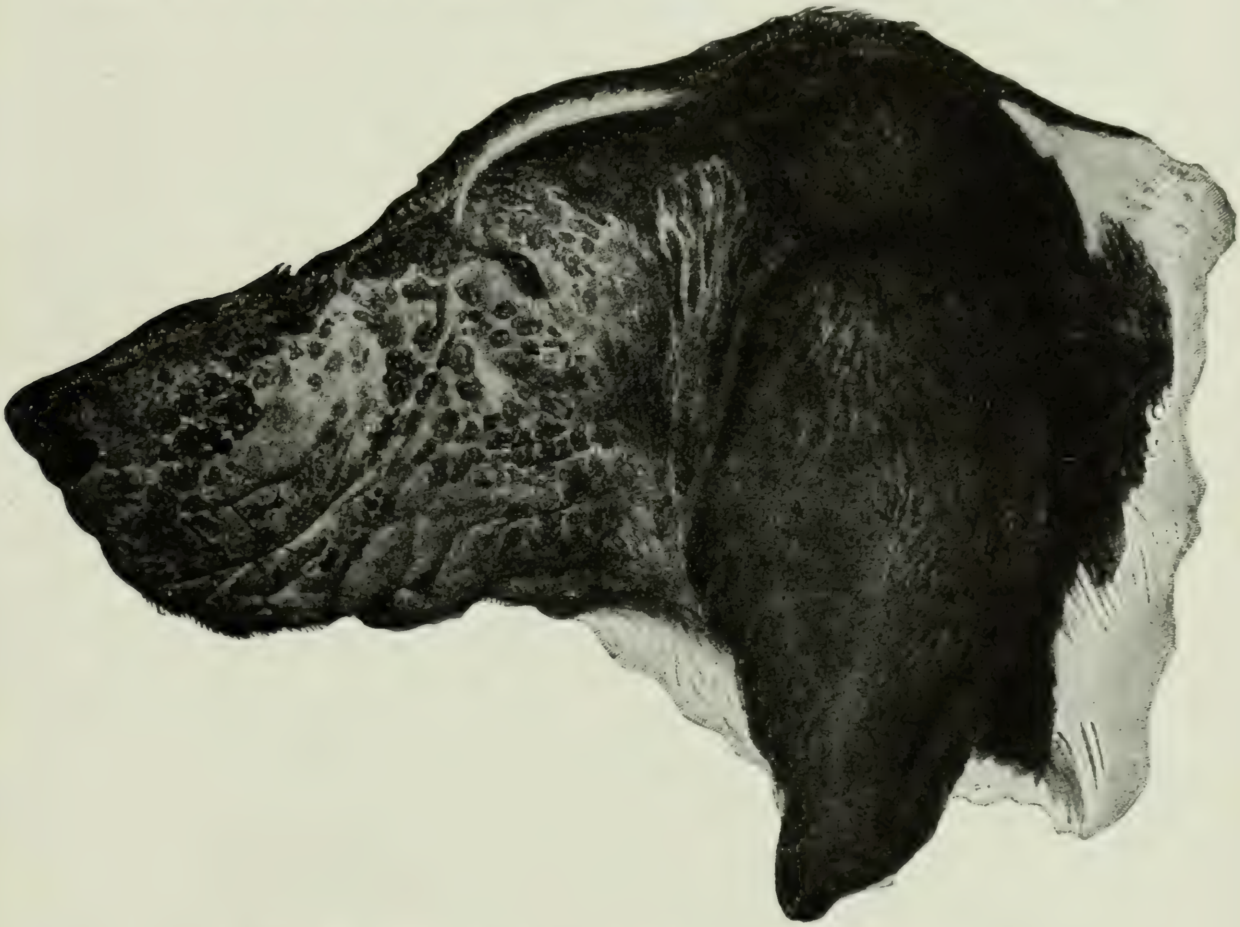


Fig. 230.—Head of dog affected with demodectes folliculorum.

consequence of the local thickening of the cuticle becomes traversed by grooves and fissures and is covered with crusts and scales, assuming a gray-blue color in some places and copper-red in others, and looks like elephant hide. As the nodules dry, there is apt to be a secondary eczema, causing the animal to scratch more or less.

The prognosis is generally unfavorable, as it is almost impossible to reach the parasites, and it is necessary to continue vigorous treatment for months, and then, when apparently the animal seems to have gotten entirely well and remains so for a certain interval, invariably it suddenly bursts out and the disease appears with increased violence. The cases which are successfully treated are those that are limited to a very much restricted area, but it must be borne in mind that every recovered case must be closely watched for months after the active symptoms disappear. This is especially the case with the squamous form, which is always considered the worst form of follicular parasitic mange.

Therapeutics.—The hair must be shaved off in the diseased portion and to include a good portion of the surrounding tissues, or if the animal is affected generally, the whole body should be clipped. This can be done by means of a scissors, clippers, or even lathered and shaved with a razor, and the hair removed should be burned and the instruments thoroughly disinfected. The animal is then bathed in warm water and soft soap, to which is added in the proportion of 1 to 10, creolin, pix liquida, or styrax. Sulphuretted baths are then to be repeated twice a week. Fill a large tub or barrel and add from 50.0 to 200.0 of sulphuret of potash, and to prevent the too free liberation of sulphuretted hydrogen 5.0 of sulphuric acid should be added. The toxic properties of the gas makes it necessary to keep the tub in an open shed or out in the air.

(a) **Treatment of the Pustular Form.**—The nature of the remedy is not as important as the manner or method of application and, above all, patience and persistence. When pustules are present they must be squeezed and emptied every day. In some instances it is necessary to open the hard nodules by means of a sharp scalpel, and at the same time apply the antiparasitic agents already mentioned with a brush twice daily. The animals, as a rule, show great pain and object to it, but to obtain any good results this must be followed up patiently. Any of the solutions may be used, as one is as good as another, but we must remember that where we have an opening directly into the deep portions of the skin that reabsorption of poisons through the membrane is much easier, consequently it is better to select a non-poisonous remedy, such as Peruvian balsam or warm preparations of salicylic acid (1 part of salicylic acid to 40 parts of olive oil). Both agents may be replaced by styrax (in oil solution). Solutions such as tincture of iodine, Lugol's solution, corrosive sublimate are all more or less dangerous and never can be used with the same freedom as the balsam.

(*b*) **Treatment of the Squamous Form.**—In this condition we must first try to reach the parasites, and this we do by systematic rubbing with acid ointments or strong concentrated salicylic ointments (1 to 5), and also with soft soap or lye. When we have removed the scabs and scales with this form of treatment we must apply the same treatment as prescribed in the pustular form. The prophylactic measures must be the same as in sarcoptic mange. No transmission of this disease has ever been observed in man. The following are some of the remedies with their formulas: Cerate of cantharides and lard, 1 to 6; tincture of iodine and chloroform; oil of turpentine and chloroform; styrax, oleum petræ and alcohol; endermol, 1 per cent. solution; zymoidin in the form of ointment; naphthol 10.0, sulphur 50.0, green soap and lard; ung. sulphur comp. with creolin baths or decoction of tobacco; silver nitrate, 5 per cent. solution; ichthargen, 10 per cent. solution alternated with iodine 10 per cent., and tar 25 per cent., each well rubbed in; styrax salve and bathing with liver of sulphur; formaline in 2 per cent. solution; dermaform, oleoformaldehyde; creolin and alcohol, equal parts; liquor creositi saponis; creosote diluted with alcohol or sweet oil; creolin, balsam of Peru and alcohol, equal parts; ichthyol, soft soap and alcohol, equal parts; oil of juniper; scraping the affected parts with a blunt knife and applying balsam of Peru; xeroform; endermal injections of iodine, or 2 per cent. solutions of carbolic acid; superficial cauterization of the skin with the thermo-cautery; carbonate of sulphur as a bath and then frequent applications with the powder and followed by an ointment, formaline 3.0, vaseline 50.0, oxide of zinc and almond powder, each 24.0. Where the skin is greatly thickened carbonate of sulphur should be used in conjunction with sulphur or neutral soaps.

And to sum up the treatment, when you find an animal that is slightly affected with the disease, clean the skin thoroughly with a strong soap and then apply the balsam of Peru liberally as directed and keep up the treatment for some time, and if you find an animal that is very badly affected then you had better destroy him, as he is not only a menace to every other dog he comes in contact with, but the chances of a permanent cure are extremely slight.

Skin Diseases Caused By Worms.

Rivolta has described having seen in the neck of a dog a herpetical eruption which he found to be due to the presence of certain embryos which he thought were the embryos of the *Filaria medinensis.* Seidamgrotzky also found in a large hound dog, a pustulous eruption on the external surface of the shank of the leg which was accompanied by violent itching and in every pustule he found from 1 to 3 small embryos 0.04 to 0.07 mm. long and having a peculiar awl-shaped caudal appendix. The embryos newly born and solitary, the females were found in the bedding of the animal. Schneider found a similar condition in a pointer, but there was little or no itching. The case observed by Seidamgrotzky was cured spontaneously in three weeks; in the case described by Schneider it was necessary to use a 50 per cent. solution of balsam of Peru in alcohol, to destroy the parasites.

Filaria.—Filaria medinensis and Filaria immitis are the principal members of this group that may cause skin affections. Filaria s. Dracunculus medinensis is prevalent on the West Coast of Africa and other tropical countries and is the cause of painful inflammation of the skin, and abscess formation in man. The dog may be similarly affected. Filaria immitis and allied species may occur in the subcutaneous connective tissue (free or encysted) and cause abscess formation.

Cutaneous Affections which are Caused by Vegetable Parasites.

We know at the present day of two skin diseases in the dog which are ascribed to the presence of vegetable parasites. These are favus and herpes. These ectophytes belong to the filiform fungi class (hyphomycetes) and may be simple or ramified, membranous or non-membranous, double contoured, cellular threads (hyphae), which become mixed in their growth and form a real fungous bed or fungous turf (mycelium). These fungous growths produce at their ends and at the point of their short side branches bead- or string-like spores, uniting and ligating each other, which are considered as sexual or multiplying organs. We cannot make a strong distinction between the fungi of favus and those of herpes, but there is a difference, as is seen in the disease in its local form, and we have given a description of both.

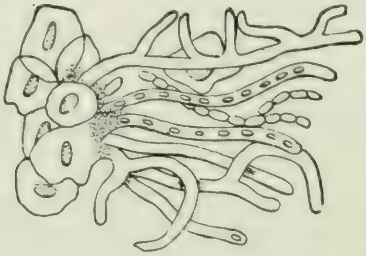


FIG. 247.—Favus mycelium with spores, magnified 450 times. *(von Dyhen.)*

1. **Favus.**—This fungus is called Achorion Schönleinii, and is developed upon the skin, between the epidermic layers in the hair-follicles, and also in the hair itself, and the secreting tissues of the claws. It is very rare and generally affects young animals. The determination of the fungus is the same method followed in trichophyton. It may be transmitted to the cat, horse, rabbit, mouse, and human beings, causing a characteristic skin affection.

Clinical Symptoms.—Favus is found in special regions of the body, namely, upon the forehead, back of the nose, abdomen, and external surface of the hind legs, as gray, gray-yellow or even saffron-yellow, dry, brittle crusts or eschars. These are about the size of the head of a pin in the beginning, but gradually by their growth cover the entire surface, and may finally become from 2 to 5 mm. in thickness. They appear in the shape of round or elliptical scutula, depressed in a saucer-like manner, generally perforated with a dull, lustreless hair, which drops out later on. If the escharous mass is removed we find a corresponding depression with exposed, very red epidermis. As a rule, this is followed by bleeding and more or less itching, and where the disease is extensive, the animal has an odor likened to the urine of cats or old cheese. The claws, when affected, become thickened, loosened, reddened, brittle and are shed.

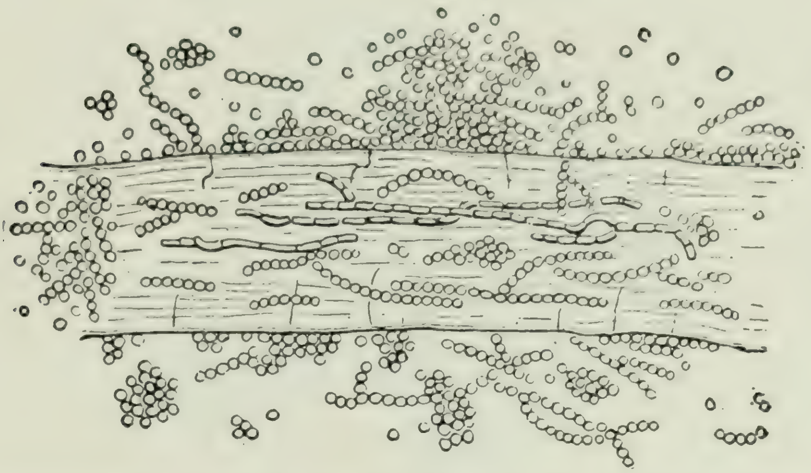


Fig. 248.—Trichophyton tonsurans, after treatment with caustic potash solutions. Enlarged 300 times.

Therapeutic Treatment.—The treatment of this disease is easy, consisting of removal of the scutula and a daily application of antiparasitic agents, especially tincture of iodine, carbolic acid and creosote solution, sublimate or salicylic acid (10 per cent. solution with alcohol), and tar soap. Chloride of sodium (common salt) has recently been advocated in the treatment of ring-worm. It is either to be applied in saturated solution or else made into an ointment with vaseline.

Concerning the prophylaxis, we refer you to the indications which are given later in herpes.

2. **Herpes Tonsurans.**—Debilitating herpes, herpetic ring, herpetic eschar, bare herpes. This fungus, which is said to be the cause of herpes, is called Trichophyton tonsurans, and is found in large masses between the epidermis cells, and especially in the hair and its follicle.

Trichophyton has a much more rapid growth than Achorion. It not only grows from one centre, as in the other form, but it may make its appearance in a number of new centres scattered all over the body, until finally the whole is strewn with numerous, isolated, round-shaped bare spots. The parasite may be transmitted to dogs, man, cattle, goats, cats, pigs, and rabbits. This fungus, which attacks the skin, spreads to the hair follicle. When the hair and scales are put in a caustic potash solution, and examined under the microscope with a low power, large masses of spores are found massed like strings of beads (Fig. 248). In isolated cases sometimes, where all the appearances point to Trichophyton, it is not found to be present. Boden and Almy describe an eruption resembling herpes, which resembled round or oval gray-white stains, covered with scales, seen on the back, flanks and the lower parts of the extremities caused by the micro-spores audouini, the cause of head fungus in children. This condition heals very rapidly. The French authors claim that all herpes is due to various forms of fungi. Schindelka claims that the majority of cases of herpes that originate in man are due to contact with diseased dogs.

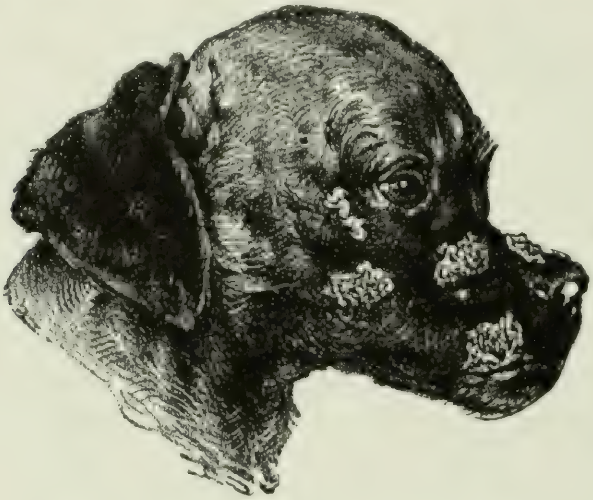


FIG. 249.—Dog with Herpes tonsurans.

Clinical Symptoms.—The eruptions which start generally in the head, region of the lips and eyes, and more rarely on the neck and legs, are marked by small, round, or elongated herpes, which vary in shape and size between a lentil and a large bean. The spots are hairless and distinctly circumscribed. The blotches are arranged at intervals and are generally very regular. They become confluent in some cases, and extend over the entire body. Affected regions show peculiar grayish-white or dirty gray asbestos-like scabs and in old cases yellowish-brown crusts about 2 mm. in thickness. These crusts may have some hair adhering to them. The skin under the crust is copper-red in color and covered with numerous millet-like nodules (swollen hair-follicles). After a certain time, if the disease ceases to spread, the scab drops off gradually, and we see a bare, scaly herpes upon which the hair slowly returns; it is very similar and might easily be mistaken at this stage for alopecia areata. In other cases we find the formation of nodular elevations, semiglobular in shape, very sensitive to the touch, rough on the surface and brown in color. They generally appear on the head, particularly on the cheeks, and are generally very difficult to treat, following a protracted course covering over one or two months. Itching is constantly present, but mild in character. After the acute symptoms have subsided the scales fall off, leaving a bare space, smooth or with a few scales on it, and the hair returns gradually.

℞.	Ac. salicylic,	3.0
	Alcohol,	30.0

Sig.—Salicylic ointment.

℞	Ac. salicylic,	2.0
	Sulphur sublim.,	6.0
	Sapo virid.,	10.0
	Ol. rusci.,	10.0
	Adeps,	40.0

Sig.—Salicylic sulphur salve.

℞.	Picis carolina,	
	Sulphur sublim.,	
	Sapo kali,	āā 10.0
	Adeps,	50.0

Sig.—Tar and sulphur salve.

The afflicted animals are often affected with secondary eczema. This, however, is produced by constant scratching, due to the irritation of the disease.

Therapeutic Treatment.—The treatment of herpes depends on the destruction of the fungus. We must, therefore, clean the affected part, lift and remove all scabs and eschars by means of a thin knife, or shampoo with soft soap, following it up by a dressing of some of the agents mentioned under the head of Mange.

Prophylaxis.—The animals must be separated, as the danger of infection to both dog and man is very great. The kennels are to be cleaned, and all straw, etc., burned, and the animals kept away from children.

Trypanosomiasis.

Under this term we class numerous infectious diseases peculiar to tropical countries. These various conditions are, generally speaking, due to a flagellate protozoon present in the blood (protozoa flagellata). Some of the diseases, such as the nagana of Africa and the surra of India, are easily transmitted to the dog by inoculation. The parasite of the nagana and the surra (trypanosoma brucei) is transmitted by the sting of certain insects (tsetse fly of Africa and the tropical horse fly of India). Under the microscope it is easily recognized by the low power. It is worm-like in form, having a blunt posterior extremity, its length depending on the animal it inhabits. In the dog it is extremely short.

The symptoms of the disease are elevation of the temperature, which may be intermittent, œdematous swellings, especially of the posterior extremities and of the thigh, scrotum, and face; pustular eruptions of the skin which may heal up and leave the animal bald; opacity of the cornea, and finally paralysis of the posterior extremities. Death generally occurs in three to four weeks. Blin states that when dogs imported into India and China, contract the disease it is almost invariably fatal, but native dogs generally make good recoveries.

African Horse Sickness.—Dr. Arnold Theiler finds as a result of his observations that dogs are susceptible to African horse sickness and further that the canine species constitutes a very important medium through which horses can be infected with the disease. This statement is combated by McFadyean who after a series of observations has reached the conclusion that dogs positively resist inoculation and that it is highly improbable that dogs act as a reservoir in propagating the disease to the horse.

Sporozoic Dermatoses.—According to Marcone these appear in two forms. One of these forms presents all of the appearances of acne. In the other form we have bluish red, irregular, nodular swellings, from which a mucilaginous (mucoid) fluid containing flaky matter can be forced out by means of pressure. Sometimes these swellings contain fistulous canals. The cause of the first form is Dermosporidium canis, that of the latter, Coccidium nudum.

TUMORS, PARTICULARLY THOSE OF THE SKIN.

A thorough description of tumors, with the different varieties and forms, cannot be discussed here as explicitly as the writer would like, and he therefore will confine himself to such tumors as are met with in general practice, and for further details would direct the reader to books on general pathology and morbid anatomy.

Tumors in dogs are comparatively common. Among 65,258 dogs examined at the Dresden Veterinary College, 2,606 (3.9%) were affected with tumors. At the Berlin Veterinary College Froehner reports 60,471 dogs examined, 2,871 affected with tumors (nearly 5%). Six hundred and forty-three dogs were operated upon; 40% of these cases were carcinomata, 13% fibromata, 10% papillomata, 7% sarcomata, 6% lipomata, 2.6% vaginal polypi, 2.5% mucous cysts, 2.2% goiters, 1.4% ranulae (cystic tumor under tongue), 1% atheromata, 0.6% dermoids and 0.3% angiomata. This goes to show that carcinomata are of the most frequent occurrence of all tumors; then follow in the order of frequency fibromata, papillomata, etc. Sarcomata and lipomata seem to be less common and the other varieties are rare occurrences. The goiters reported included only those that were operable. With reference to carcinoma Schuetz's statistics for the Berlin Veterinary College are interesting; in the course of 14 years autopsies were held on 1,241 dogs of which 69 (5.4%) had carcinoma of which 20.4% affected the external integument, 26.6% the urino-genital apparatus, 25.8% the digestive apparatus, 26.6% the respiratory apparatus. As to age: among 65 dogs 10 (15%) were under 5 years of age, 18 or 28% were 5 to 6 years of age, 22 or 34% were 7 to 8 years of age, 12 or 18% were 9 to 10 years of age and three (4%) were 11 to 12 years of age. Froehner never observed a case of carcinoma in a dog under two years of age. This permits the conclusion that carcinoma in the dog, as in man, increases in frequency with advancing age.

In regard to tumors that appear in certain definite regions of the body (mouth cavity, anus, milk glands, etc.), technic for operation, facilities and preparation of patient, special works should be consulted.

In preparing the field of operation attention is here called to the fact that depilatory substances are practical substitutes for the razor in regions of the body adapted for their use (this of course excludes the region around the eyes). After the hair is cut short with scissors a mixture of equal parts of barium sulphid (baryum sulfuratum purum), zinc oxid and talcum (made into a paste with water) is applied to the area to be cleared. Five minutes later the entire mass including the hair can be wiped off with a dull instrument. The skin is uninjured and the hair will grow out again. Strontium—or natrium—sulphid may be substituted for the barium sulphid and starch for the talcum.

With reference to general and local anesthesia it may be noted that all of the methods as well as agents recommended for this purpose are equally applicable to the dog although caution must be observed with the use of chloroform. At any rate this agent should never be used except on dogs with perfectly sound circulatory and respiratory apparatus, and the chloroform should be tested in regard to characteristic odor which appears after undue exposure to light and air (acrid, choking odor) and its effect upon litmus paper (fresh chloroform will not change blue litmus paper to red). It is always advisable to use only fresh purchases from a reliable druggist. By limiting the circulation of the blood by means of rubber bands applied around the extremities the danger of chloroform narcosis may be reduced. Approaching danger may be met by immediate removal of the rubber bands (or tubing). It is true that more or less partial paralysis of the hind extremities is apt to persist for some time after the use of chloroform (Kuennemann). Morphine (morphinum hydrochloricum) is practically a perfect substitute for chloroform. This is injected subcutaneously fifteen minutes to half an hour before operating in doses, according to size of dog, of 0.01 to 0.15 Grams. Vomiting, which follows in about 60% of all cases, is of no significance. To counteract the toxic effect of large doses (heart paralysis) atropin sulfuricum (0.002 to 0.005) may be administered with the morphin. When the author, for any reason, resorts to the use of chloroform he takes advantage of the combined morphin-chloroform narcosis; he uses pure chloroform until narcosis ensues, then follows with ether or alternates ether and chloroform. Werr recommends Pantopon-chloroform narcosis. Kuennemann injects 0.02 to 0.08 morphin with 0.003 to 0.006 atropin one-half to one hour before administering the chloroform; Buergi uses scopolamin instead of atropin. Many regard Billroth's mixture (Chloroform 3, ether and alcohol āā 1) as specially suitable for dogs instead of pure chloroform. Wachsmuth's mixture (Chloroform 5, oleum terebinth. rectificatum 1) is preferred by others while Frick has had very good results with Schleich-Siede Mixture (chloroform, ether, and petroleum ether). Intraperitoneal infusion or chloral hydrate solution (0.25 to 0.30 per kilogram bodyweight) is associated with danger and may be dispensed with. The same may be said of subcutaneous or intraperitoneal injections of magnesium sulphate which have little practical worth.

Cocain, if applied in the form of infiltration anesthesia, is not attended with danger; however, the application of concentrated solutions subcutaneously (for local anesthesia) should be limited to small doses on account of the very toxic property of this drug. It is possible, by means of the addition of suprarenin (adrenalin) to increase the efficacy of cocain considerably and thus permit the use of smaller and safer doses. Among the less toxic substitutes for cocain we have acoin, eucain, stovain, novocain, alypin and others.

Lumbar anesthesia (spinal anesthesia), recommended for painless operations on the abdomen and rear extremities has simplicity in its favor. The lumbo-sacral foramen, which must be located somewhere between the median angles of the ilium, serves as the port of entrance for the injecting needle. A 2 to 4% stovain solution (in place of a 1 to 2% cocain solution as formerly) is the agent injected. The dose of stovain is 0.002 to 0.007 G. per kilogram of body weight. Small dogs take comparatively larger doses than large ones (0.004 to 0.007). The fluid is injected warm. The effect of large doses may persist for hours.

In regard to further details and the use of light and ray treatment, see special works.

Tumors are rather common in the dog. Of the various neoformations carcinoma seems to be the most frequently seen. Next is the fibroma, then the papilloma and the sarcoma, and the lipoma, the latter being comparatively rare. Regarding the frequency of cancer, out of over twelve hundred dogs only about 5 1/2 per cent. were affected with cancer, and of the organs attacked they were in the following order: Respiratory apparatus, 26 per cent.; urino-generative apparatus, 26 per cent. digestive apparatus, 25 per cent., and the skin, 20 per cent. As regards age, Frohner found that 15 per cent. were in animals under five years of age, 25 per cent. between the ages of five and six, 34 per cent.; between seven and eight years, and 18 per cent. between nine and ten years, while 4 per cent. were between eleven and thirteen years. No animal under two years was found to be affected with cancer.

The following varieties of tumors of the skin and subcutis are of special interest:

1. **The Fibroma.**—This neoformation occurs rather frequently in the dog, the most frequent location being in the skin and subcutis of the head, neck, abdomen and spine. Fibromata are also found on the chest

and extremities. They may occur singly or in large numbers. They may be hard or soft according to the amount of intercellular tissue they contain. They are usually clearly outlined, rounded with a smooth surface (fibroma durum), more rarely soft in consistence, and not so well circumscribed (fibroma molle, fibroma molluscum). The latter is frequently bluish-red with a network of veins on its surface. The fibroma frequently hangs down, particularly when it is in an inferior portion of the body, like the abdomen (fibroma pendulum) (**Fig. 251**). In parts where there is slight movement of the skin, and the cutis is firmly fixed, such as the ear or metatarsus, the fibroma assumes a flat, circular, coin-like appearance, and has a rough or granular surface. In some cases there is tumefaction of the skin, as on the edge of the nose, elbow, tuberosity of the ischium, the outer part of the forearm, knee and legs. These callosities are usually called recumbent, bed or kennel tumors. They are generally bluish-gray or grayish-red in color, roughened externally, and irregularly circular. They vary in size from a small pea to the palm of the hand, are generally devoid of hair, their flat surface being smooth, furrowed, or irregularly elevated. The skin occasionally develops acne from pressure or alteration of the tissue. Fibromata, both hard and soft, are not malignant.

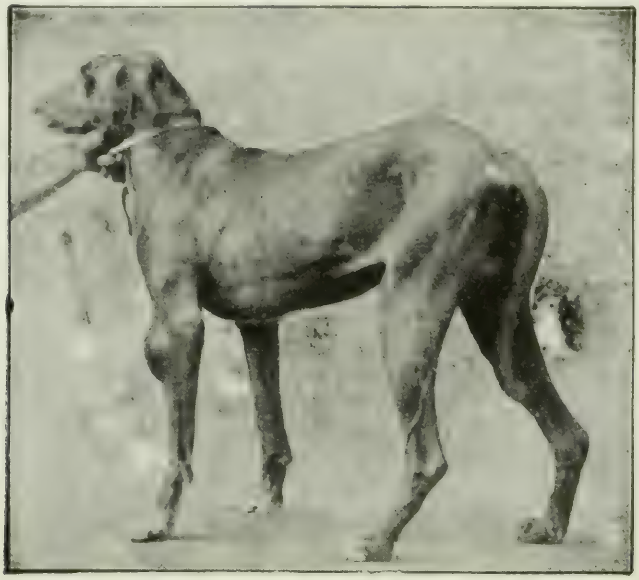


Fig. 250.—Hard fibroma on forearm.

Many pathologists are not inclined to regard the callosities known as bed or kennel tumors as fibromata. Most definitions of the term tumor include the clause that they are without demonstrable cause.

This would exclude these callosities, as their cause is obvious, usually growing on prominent parts, exposed to friction and pressure whenever the animal assumes the recumbent position.

2. **The Lipoma.**—These fatty tumors of the subcutis are rarer than fibromata. They are generally round or oblong in shape, very distinctly circumscribed, being separated from the surrounding structures by a layer of connective tissue. Sometimes they are of considerable size, but as a rule they are of very slow growth, and often pedunculated or lobular in outline and diffused in different directions. The mixed forms of lipoma and fibroma (fibrolipoma) sometimes grow to an enormous size, and are seen as nodular collections under smooth skin. As a rule lipomata are found on the tendons and their sheaths, the chest, shoulders, and tail. Frohner found a lipoma that surrounded the anus in a half-circle. Lipomata may be multiple but are not malignant.

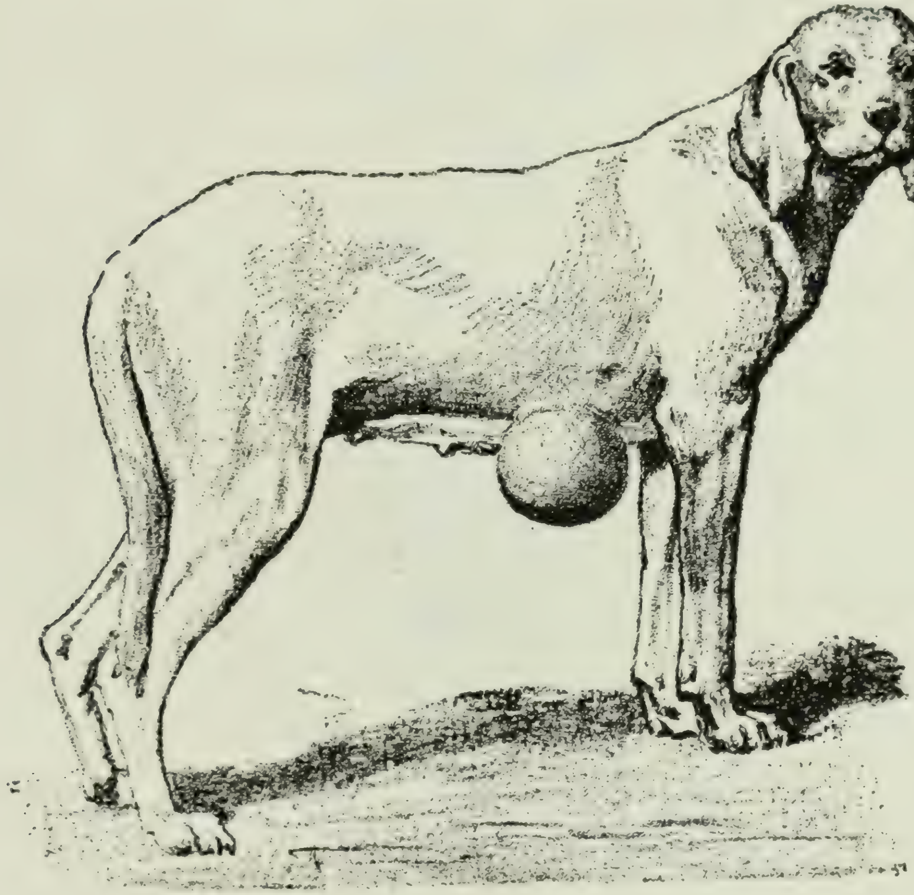


FIG.—251.—Dependent fibroma.

3. **The Sarcoma.**—A tumor made up of embryonic connective tissue, originating in various parts of the body, such as cartilages, bones, periosteum, adipose tissue, and in fact any of the connective tissues of the body. Depending upon the size, shape and disposition of the com-

ponent cells, sarcomas are classified as small and large round cell, small and large spindle cell, giant cell, melanotic and lympho-sarcomas. Sarcomas are generally considered as malignant tumors (1) because they usually show a tendency to become large, (2) because they are apt to reappear after removal, and (3) because under certain conditions they are apt to form in other parts of the body by metastasis. Their malignant character is generally much greater in proportion to the size of their cells and the softer their intercellular substance.

The external anatomical appearance of a sarcoma does not always present characteristic symptoms. In most cases these tumors are round, distinctly circumscribed, and sometimes they form encysted knots, which vary in color and consistency. Their color depends, as a rule, on their blood vascular supply, and any blood extravasations which may have occurred also produce certain alterations, so that on section a sarcoma may appear white, yellow, brown, gray, dark red, and even entirely black, as the melanotic variety. This pigment sarcoma, or melanoma, is extremely rare in the dog, although Gray asserts that it is very common in Yorkshires, where it is seen in the form of small black excrescences the size of a pea. Troutman describes an interesting melanosis of the toe of a three-year-old setter.

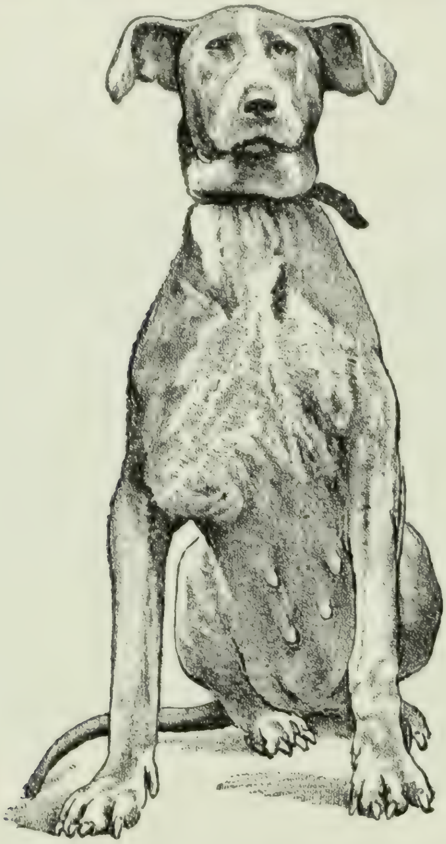


Fig. 252.—Sarcoma of the soft parts.

The metamorphoses which occur in the sarcoma are of some diagnostic value, especially the mucous softening, which leads to the formation of cysts and sometimes to bony deposits. This is frequently noticed in sarcomas, and the ulceration of the adjacent skin and mucous membranes occurs without producing any active disintegration of the tumor. Notwithstanding the malignant character of the sarcoma, it may remain in the same condition for years, and never inconvenience the animal, or after lying quiescent for years it may suddenly begin to grow with incredible rapidity.

The myeloid or medullary sarcoma is a rare form of tumor which grows in the marrow cavity of the bones. They have been noticed in the forearm, shoulder-blade, arm, femur, maxilla and penis. Circumscribed nodules are developed in the medullary cavity which generally crowd out the bone by their growth, and when new bone is formed from the periosteum, fill up the entire cavity. In this manner we find enormous lumps, or masses, possessing the firmness and hardness of bone, and in the centre is found a soft tumor surrounded by a bony cyst. Sooner or later the soft parts penetrate the bony envelope and certain of the fluid escapes.

4. **The Papilloma.**—A benign tumor originating from a hyperplasia of the papillary layer of the cutaneous and mucous membrane, with a proportionate formation of connective tissue. Papillomata are divided into the hard and soft varieties.

The hard papilloma or wart is a neoformation of the papillæ of the skin and of the epidermis. Warts differ very much in size, from a lentil to the size of a large pea. The external covering of a wart is very often hard and firmer than that of the connective tissue, so that the surface is surrounded by a firm, hard, horny covering (horny warts). The reverse is found in the case of the soft, fleshy warts. These little growths are found on the skin of dogs of all ages; as a rule on the head and back, but also in other regions, and they frequently disappear without any treatment (Fig. 253). Now and then the horny warts grow to a very large size and form what are called "cutaneous horns." Such are found on the forehead, the ear, and the flanks. They are generally seen in old dogs, and at times have a tendency to be malignant. Enormous numbers of warts are sometimes seen in the mouth, on the buccal mucous membrane and tongue, and that they can be reproduced by inoculation has been proved by McFadyean and Holding.

A variety of the papilloma is the flat condyloma. These are certain marked malformations which have the shape of a papilla, but as a rule are ramified and divided, forming cock's-comb-like or cauliflower-like collections. In some cases they appear as true papillomata, sometimes as a sarcomatous formation. As a rule they appear on regions other than the skin, such as the lips, cheeks, and prepuce, and also upon the buccal mucous membrane, anus. They are generally salient and bleed easily, due to the large number of blood vessels they contain, their softness, and very thin epithelial covering. The writer has noticed that dogs affected with condyloma of the vulva or penis also show these formations quite frequently on the edges of the lips. Gratin has often seen the obscure transmission of condylomata from one dog to another. This would tend to establish the fact that this variety of tumor is contagious. (See Infectious Genital Tumors.)

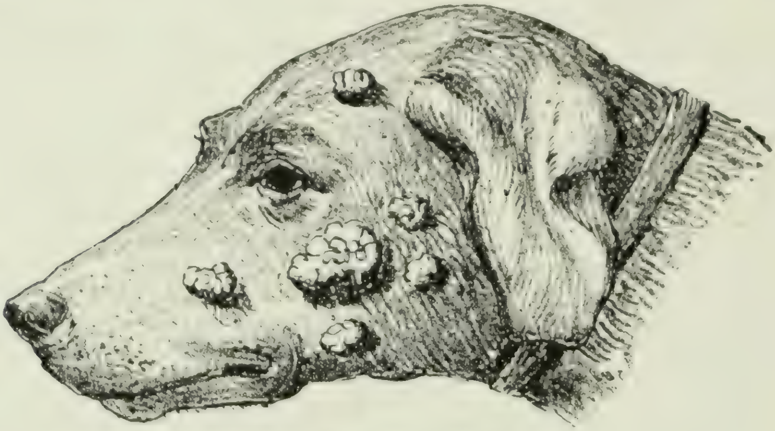


Fig. 253.—Multiple formation of warts.

5. **The Carcinoma.**—By the term carcinoma we designate that neoformation the essential feature of which is the overgrowth or accumulation of epithelial cells, some of which have penetrated the basement membrane, by root-like projections, into the underlying or neighboring structures. It is the commonest of all neoplasms. These cells possess the peculiar property of forming metastases, by way of the lymph channels, producing a general cancerous infection of the body (carcinomatosis), and are, therefore, considered malignant. Any organ or structure in the body having epithelium in its make-up may be the seat of carcinoma. Most cancerous forms are distinguished by their tendency to regressive metamorphoses. These include mucoid, colloid and fatty degeneration, with cystic formation, calcification, cicatricial contraction, and in superficial carcinoma of the skin and mucous membranes, ulcerative processes, with the formation of purulent foci. Those showing a strong tendency to spread over the surface are termed "phagedenic." Necrotic changes are frequent, the ulcerating portions discharging a foul, sometimes bloody, material. In cases of some standing the dog may

show the effect of this process, losing flesh and showing a general condition of cachexia. Carcinomata are generally divided into:

(a) Squamous epithelioma, squamous cancer, or cellular epithelioma.

This variety occurs in the cutaneous membrane, and in all mucous membranes containing squamous epithelium, as the mouth, throat, larynx, eyelids, ears, cheeks, external genitalia, bladder and urethra, rectum, vagina and uterus. This form of cancer is frequently seen in old animals. It is a peculiar fact that this cancerous growth may accumulate rapidly for a short time, and then remain stationary without increasing further in size. Squamous epitheliomata appearing in the mucous membranes, especially the vagina, which deserves special mention, have a great tendency to extend superficially, followed by a cancerous disintegration, also by a constant, bloody, purulent discharge. Ulceration usually takes place in these cancers, sooner or later. Some parts may be covered with a scab-like crust, while other parts may be raw and bleeding. Fistulæ frequently form.

(b) Adeno-carcinoma, or malignant adenoma.

This variety may originate in any organ containing glandular epithelium. It is probably most often seen in the mammary glands of old bitches. This cancer of the mammaries is marked by the following characteristics: It is of slow growth, particularly hard and firm, and has a tendency to remain stationary for a long time. In some regions of the glands we may see a small, hard knot developed, which is not sensitive to pressure and shows no signs of inflammatory action. This enlargement gains slowly and may be accompanied by other knots in the immediate neighborhood, which finally unite and form one mass. The carcinoma at this stage is found to be a hard, irregular, circumscribed tumor, and united, as a rule, with smaller masses by a thin cord-like enlargement that lies in the integument. When this enlargement is located very near the skin it shows a peculiar cicatricial contraction, and especially if it is near the teat this may be drawn entirely into the skin. This is quite common. We also observe great distention of the cutaneous veins, which may even be varicosed. As a rule, the enlargement is rarely confined to one, but we may find scattered through the gland numerous lumps or knots of various sizes. We also see in the mammaries of the dog fibromas, chondromas, adenomas, sarcomas, and cysts, but these are much rarer than carcinoma.

It is hardly possible to confound these tumors of the mammaries with inflammation of the lacteal gland. True acute mammitis occurs very rarely in the bitch, and is indicated by a circumscribed, painful, very sensitive reddened swelling of a definite glandular section. The section may undergo complete disintegration, forming an abscess and sloughing, or we see chronic inflammation with a formation of knotty lumps, and a peculiar cicatricial contraction. True mammitis must not be confounded with inflammation of the lacteal glands, which may appear in bitches that are nursing and deprived of their young. The swelling disappears in a few days by itself, but it may be hastened by a light diet and saline purgatives. In very rare instances there is a peculiar condition of the lacteal glands that is seen in bitches that have had several litters of pups. About forty-five days after they have been in "heat" we may find a general enlargement and filling up of the entire glands, also the appearance of a thin milk or colostrum in the glands, and every appearance of active lactation. This might lead the practitioner to believe that the bitch was in whelp.

The tendency of carcinoma to become malignant and cause a general infection of the whole body is especially marked in the soft forms of cancer, particularly those having a tendency to ulceration and degeneration, while the hard forms, such as above described in cancer of the mammaries, may remain months and even years after producing no other effect than a gradual enlargement. The process is generally developed in the lymphatic glands, but we may see the appearance of secondary tumor centres which swell up without being accompanied by any pain or inflammation. A large part of the body may become affected in this manner, that is to say, there is a gradual development of the process through the entire body, these various tumors being supplied from the primary tumor or carried into the circulation and scattered in all directions, forming new centres of development. We may see this occur in cancerous masses in the liver, kidneys, and lungs, producing very little irritation of the surrounding tissues beyond the central tumor, but we find that the animal falls away quickly, becomes emaciated, has weak heart-action, and presents all the symptoms of what is known as cancerous cachexia.

The prognosis is always unfavorable. Removal of a cancerous tumor may only be made when the neighboring lymphatic glands have not become affected, and where the animal is in good nutritive condition. Cases of ulcerated carcinoma must always be considered unfavorable, except in the form of cancroid, which has been already described. The treatment of cancer consists of speedy removal and keeping the animal in as healthy condition as possible.

6. **The Myxoma.**—A tumor made up of mucous or gelatinous connective tissue. They are apt to appear on the head and back, more than any other place. They are frequently multiple primarily, and sometimes attain great size. The myxoma is a benign tumor, but it may recur after incomplete extirpation. Usually these tumors are round or oblong, clearly outlined in the tissue, are elastic on pressure, and they stand out in the skin in semi-hemispherical elevations. The cut surface is pale,

moist, and exudes a thin, stringy mucous material when squeezed. They are frequently found combined with fibroma and sarcoma. A very characteristic example of myxoma is described by Velmalage, in which he found from the neck to the root of the tail, as well as on both sides of the thorax, the outer surface of the hind legs, and the anterior region of the sternum, great numbers of nodules varying in size from a pea to a hazel nut, or even as large as a walnut.

7. **The Adenoma.**—One of the parenchymatous group of tumors, composed of glandular epithelium, which may assume either the type of a tubular or an acinous adenoma. They always originate in some gland, are either single or multiple, and can be distinguished from simple glandular hypertrophy by the fact that they stand out prominently from their surroundings, are knotty or scirrhous, or sometimes quite soft. Their growth is slow and they are seen most frequently in the breast, rectum, thyroid and ovary. Adenomata are not malignant, primarily, but just as soon as the basement membrane is penetrated by the tumor, it then becomes a carcinoma, malignant in character. Cystic degeneration is probably the most common of the retrograde processes. When they are superficial, we may have ulceration taking place.

8. **The Angioma.**—A tumor composed of blood vessels and their contents. According to the kind of vessel present, angiomata are designated either capillary, cavernous or aneurysmal. The capillary type is the most common. In the dog these tumors may frequently escape notice, on account of the color of the skin and the hair obscuring them. They may occur in any part of the skin, and some attain the size of a hen's egg. They are non-encapsulated, but usually only involve the corium. They are flat, but slightly elevated, and the color varies from a light to a dark red. Shindelka observed a nævus vasculosum (birth-mark) on the right side of the head of a white poodle, the formation being irregularly outlined, bluish-red in color, and involving the forehead, temporal region, and a portion of the eyelids. The author saw a similar condition on the chest of a Russian wolf-hound. Simple enlargement of the veins has been observed on the scrotum.

9. **The Myoma.**—A tumor made up of muscular tissue. According to the variety of muscle making up the tumor they are designated leiomyoma (smooth or involuntary), or rhabdomyoma (striated or voluntary. Myomata are rare, but may originate in any structure containing muscular fibres, voluntary or involuntary. However, these tumors may exist in structures normally having no mucsular fibres in them, but these cases are rare. When a myoma exists in normal muscle, it sometimes so closely resembles the normal muscle as to be distinguishable with difficulty.

10. **The Osteoma.**—A bone tumor, either compact or spongy, and usually developed on the body of a bone. As a rule it occurs on the periosteum, but more rarely in the muscles, fasciæ, tendons, and still more rarely in the thyroid glands. (This last condition was described by Siedamgrotsky.) They are usually recognizable by their location and consistency. They frequently occur in combination with sarcomata and chondromata. The size varies, the author having seen an old dog in which he found osteomata nearly as large as a hen's egg. These were remarkable for their extremely regular surface, and were attached by distended tendinous tissue to the left of the transverse prolongation of the fifth cervical vertebra, but were removed without any bad results. As a rule osteomata are removed only when they are closely connected with the bone, and when they are likely to cause a great deal of trouble.

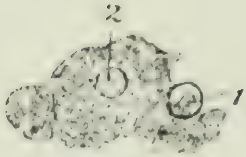
11. **The Chondroma.**—A tumor made up of cartilage cells, usually of the hyaline variety, but sometimes they are observed to be of the fibrous or yellow elastic type. They may arise from any structure containing cartilage, such as the trachea, nasal septum, ribs and the ends of bones. They are frequently met with in the shafts of long bones (enchondroma). Usually they do not grow to a very large size, and are non-malignant, although they may be multiple primarily.

VENEREAL GRANULOMA.

Canine Condylomata.

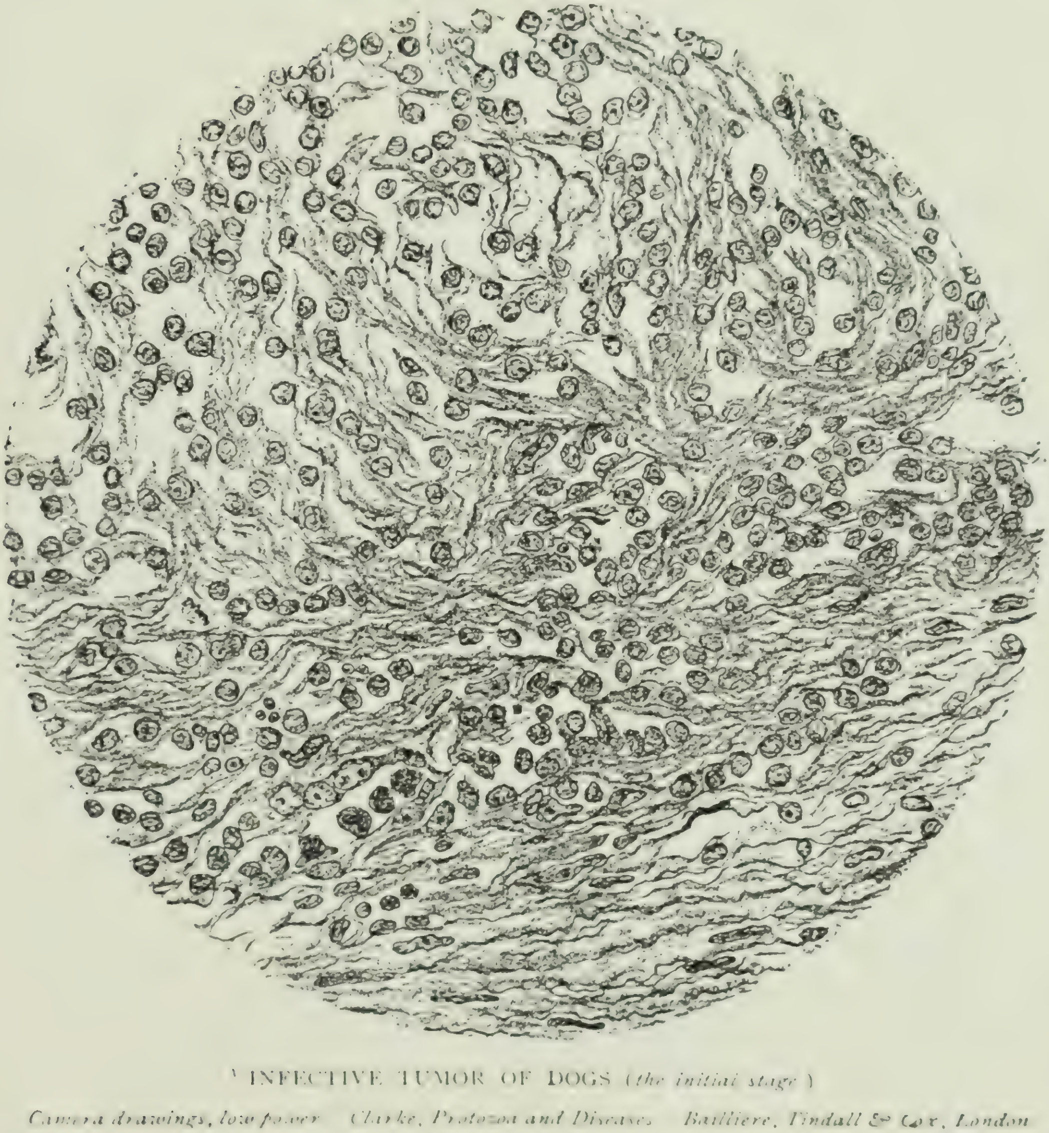
Infectious Genital Tumors.

This is a specific infectious disease generally transmitted during copulation. The condition seems to be almost entirely confined to the higher bred animals. Particularly since careful selection in breeding has been made, and the best bred dogs are apt to be infected. It was first observed on the continent and later in Great Britain, and then from the large number of dogs that have been imported into the United States, it made its appearance in America. Its peculiar character of reaching its highest development in three months or about that time and then commencing a retrograde degeneration and healing up, has to a certain extent checked its development and has a tendency to keep it within bounds, and also that it is rarely seen in common bred dogs. The full effects of the disease, which are often permanent in character, affect the prepuce and penis of the male and the vagina of the female. In the male the region of the perineum and scrotum may become involved. This is seen in the formation of a mass of globular formations that varies from the size of a pea to that of a large marble and have been described as condylomata. They may be solitary but are generally gathered in a grape-



INFECTIVE TUMOR OF DOGS (*natural size*)

***Circle 1** includes area shown below. Circle 2 shows fully developed stage*



1 INFECTIVE TUMOR OF DOGS (*the initial stage*)

Camera drawings, low power. Clarke, Protozoa and Diseases. Baillière, Tindall & Cox, London

like mass. Its chief mode of dissemination seems to be from the male, for when a particularly good stud-dog is affected numbers of bitches become inoculated; thus the disease is carried in all directions.

In the male the disease starts by redness and tumefaction of the prepuce which is irregular in outline. There is a bloody discharge and on baring the penis we find a circumscribed tumefaction, deep red in color and by a gradual elevation of the tissue it developes into round nodular tumors; these become lobular masses, are grayish-pink, varying to purplish red; they bleed easily on the slightest manipulation. There is more or less discharge of bloody muco-purulent fluid from the prepuce, and that organ is swollen and deepened in color at the free portion. If there is a chance to observe the disease from the onset, it is found to commence with a slight tumefaction of the tissues and formation of small firm nodules, which increase slowly and finally develop into rounded masses; then these masses become softened, break down and leave a deep ulcer with raised edges from which a thin tenacious discharge flows.

In the bitch the tumors are rarely noticed until a discharge is seen at the vagina, or she shows great pain during copulation and will generally refuse to take the male. A digital examination shows a number of tumors in the form of elevations either sessile or pedunculated, in severe cases the walls of the vagina are covered with them. The sessile seems to be commonest in the bitch; they lie, as a rule, well up in the anterior portion of the vagina.

The tumors will break down and disappear, but in the bitch they invariably leave a cicatricial contraction so that while the bitch may become pregnant she has great difficulty in parturition, the vaginal walls in that particular portion becoming inelastic, or the male may attempt to serve the bitch and after several attempts, will cry and withdraw the penis. In other cases if the bitch becomes inoculated by the dog the tumors grow so rapidly that they practically close the vagina so as to produce dystocia.

That this disease is contagious there is not the slightest doubt, and that it is easily transmitted experimentally has been shown by Washburn and Smith, who state that, "For the first few days after inoculation a swelling can be felt, partly due to the fragments of the tumor introduced and partly to inflammatory exudation. In some cases this swelling completely subsides, so that nothing can be felt until the appearance of a small nodule indicates that inoculation has been successful. In other cases the swelling persists, and it is difficult to decide whether the inoculation has been successful until a definite increase in the size of the swelling has taken place. The usual time at which there is distinct evidence of the first appearance of the growth after inoculation is about three weeks, but it varies between twelve days and a month. * * * The small firm nodules which first appear gradually increase in size, and form rounded lobulated masses. At the commencement they are freely movable beneath the skin, but at a later period the latter become thinned out, of a bluish-red color, and firmly adherent to the growths. * * * The maximum growth is attained in about three months. A curious regularity obtains in this respect. * * * Having reached this stage, retrograde stages are not long in appearing; the growth becomes soft and flabby, and slowly dwindles until nothing is left to indicate its former presence. * * * In nearly half the cases the subsidence of the tumor was accompanied by ulceration; the thinned-out reddened skin giving way over the growth, which has previously undergone softening, and there results a deep ulcer, from which a thin grumous discharge flows. Even when these retrograde changes are occurring, fresh growths occasionally take place at the periphery of the tumor."

Clake, who has carefully examined the tumors, likens them to the alveolar sarcoma of the human breast and classes them as granulomata. He describes three stages and shows marked changes in each. And concludes that they may be divided into three stages:

1. "The early granulation-tissue stage—*i.e.*, a filling out of the shrunken connective-tissue cells.

2. "A stage in which the granulation-tissue cells have assumed the character of sarcoma-cells. Some of these cells exhibit a mitotic activity comparable to that seen in the earlier stages of invasion of the cells of the cornea by the protozoa of vaccinia in their hyaline or chromidial phase. Among the tumor-cells in this stage are bodies of typical protozoon characters; and—

3. "A final stage in which chromidial parasites escape from the nuclei of the tumor-cells, rapidly enlarge, become nucleated, and subdivide; this process terminates in the formation of minute bodies, most of which are in the chromidial condition."

Treatment.—In the male it is comparatively easy. If the tumor has not broken down it should be removed by filling the prepuce with cocaine solution, then have an assistant retract the prepuce and expose the free portion of the penis. The tumors must be freely cut away with a pair of curved scissors; then to the excised portion of tissue apply the thermo-cautery, or with a camel's hair brush apply pure carbolic acid which should be neutralized immediately with an alkaline solution. There is always considerable hemorrhage, but this is easily controlled.

French advises, if there should be great hemorrhage, to take one or two stitches in the mucosa. This is to be done only where the hemorrhage is extreme and the stitches to be removed not later than twenty-four hours afterwards as the sutures cause great irritation. The non-irritating substitutes for nitrate of silver such as the silver proteids and albuminates are particularly useful in this condition and should be applied locally in the male and injected freely in solution in the bitch.

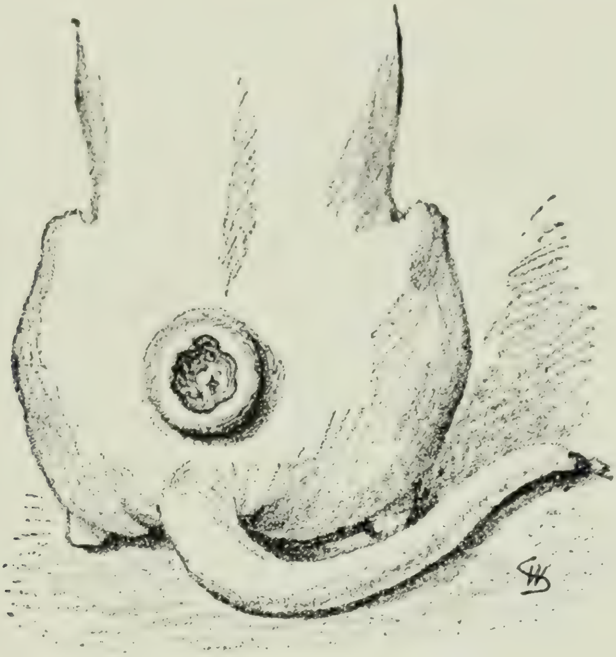


FIG. 254.—Chronic ulcer.

Recovery particularly in the male is rare and some cases may seem to recover and apparently the disease has been entirely eliminated from the system and even when on careful physical examination no trace can be found, several cases have been recorded where the dog has again been used for service without any trace of the disease being carried to the bitches that were bred to him, but as a general rule quite the opposite has occurred, and a dog that has been affected is and must always be a dangerous animal to breed from.

In a great many cases the granuloma on the penis resists all treatment, either medicinal or surgical, and it is a question among a number of observers whether surgical interference is wise, for so many cases seem to become so very much worse when any surgical procedure is attempted. The recent treatment used in infectious granuloma in man, that of certain intravenous injections of tartar emetic, has up to the present time not had the test of time although several cases have been reported that seem to have responded to treatment but the only suggestion in this edition would be to try it, based on the value it has had in man.

The male, if treated early, generally recovers in three or four months, in the bitch if the vagina is involved to any great extent it is not wise to breed her. If asked to give an opinion as to her purchase as a brood bitch it would be well to advise against it.

General Therapeutics of Tumors.—The treatment of tumors of the mouth, anus and mammary glands has already been taken up and the reader is referred to those conditions under their respective titles. The internal medicinal treatment of tumors by preparations of iodine may be used in cases of goitre. In carcinoma and sarcoma we may give arsenic in the form of a solution of mercury, iodine, and arsenic (Fowler's or Donovan's solution).

Surgical Treatment.—This is generally palliative in cases where the tumor is difficult to reach, being restricted to the prevention of hemorrhage, suppuration, and a fetid odor.

Tampons of tow which have been saturated in a solution of chloride of iron and injections (where there is an opening) of subsulphate of iron, 1 to 90.

This palliative method is only indicated where a radical operation cannot be performed from some cause or location of the tumor and where the owner wishes to keep the animal alive as long as possible without surgical interference.

The methods of radical removal of a tumor are as follows (these do not include torsion or twisting):

Ligation.—This method may be applied in all cases where the base of the tumor is not too broad and if it has not penetrated deeply into the tissues. It is useful in many forms of warts, fibromas, and sarcomas; but, as a rule, it is objectionable because it acts slowly, is extremely painful, produces great inflammation with suppuration, and the tumor has a tendency to return. The general mode of procedure in this operation is to ligate the base of the tumor with a strong silk thread or rubber band wound several times. These growths can also be subdivided by means of the ecraseur, using either the chain or wire. The chain of the ecraseur is put around the base of the tumor and greatly tightened by means of the instrument, when the tissues are gradually crushed. The writer has used the wire-loop shown in its simplest form in Fig. 177 for the removal of epulides. The bleeding, as a rule, is very slight if the crushing is done slowly, but there is always danger of a recurrence

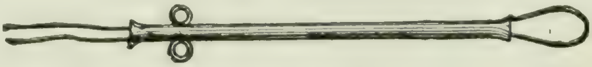
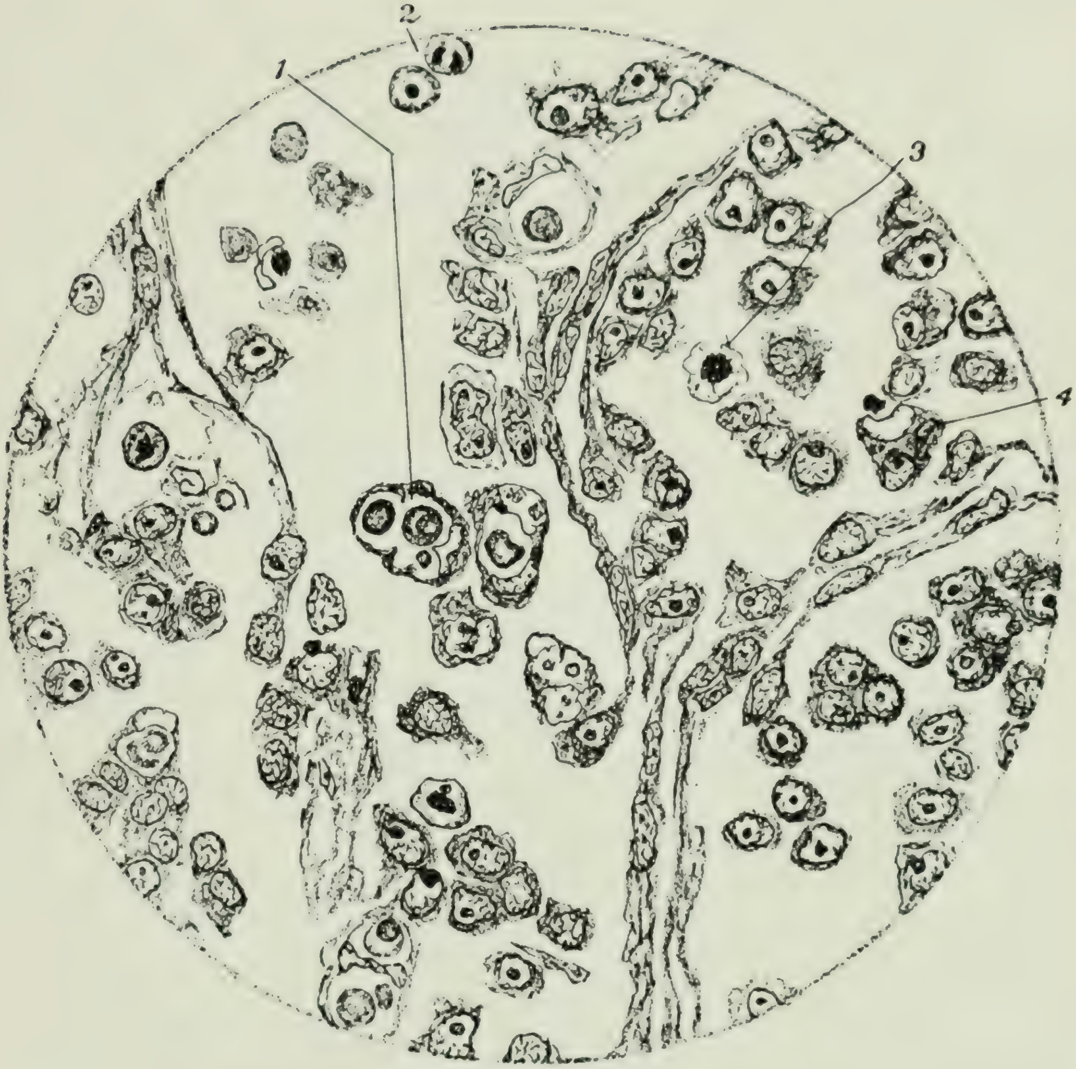


FIG. 255.—Wire ecraseur.



INFECTIVE TUMOR OF DOGS (*the fully developed stage.*)

1. Cells distended by cell-inclusions. 2 and 3. Cells with active nuclei. 4. Cells with amœboid bodies close to empty nuclei. Camera drawing, low power. Clarke, Protozoa and Diseases. Baillière, Tindall & Cox, London.

of this condition. We must, therefore, touch the open space left after the removal of the tumor with a thermo-cautery.

Cauterization.—We may destroy tumors of the cutaneous or mucous membrane, flat warts, etc., by means of the thermo-cautery, or we may use some of the various cauterizing substances. The thermo-cautery has the advantage of being kept at an even heat for a long time, and on account of this steadiness is especially valuable in controlling hemorrhages

The caustic chemical substances, such as burnt alum, caustic potash, sulphate of copper, chromic acid, chloride of zinc, and nitric acid, are not especially valuable in the therapeutic treatment of tumors.

Removal—Extirpation.—This method is the best one to follow in all large tumors which are easily reduced. Various modifications are possible, according to the form and location of the tumor, but the following is the general mode of procedure:

In making the incision the cut should be made by an ordinary scalpel between the tumor and soft parts, making the incision, if possible, in the direction of the hair and of the large blood vessels. After the extirpation of the tumor, the cavity should be cleared of all loose tissue by means of a pair of scissors or scraped with a curette. Ligate all the blood vessels. Clean the wound of blood clots, and touch the whole freshly cut surface with pure carbolic acid, as it frequently facilitates healing by first intention. Then bring together the edges of the wound by means of sutures. Place over the wound an antiseptic dressing.

Anæsthesia.—We have already given information as regards the last three points of the operation. We must confine the animal, in all operations, in such a way as to prevent him from biting or moving that part of the body which is operated upon. It is best to place a leather strap or broad cotton tape bandage around the mouth (see Fig. 178) and have an assistant to hold it. This method is preferable to strapping with cord, etc. Hobday, Gray and Berdez have constructed special hobbles and operating-tables which are to be used in hospitals.

In very serious operations, accompanied by great pain, it is advisable to place the animal under the influence of some anæsthetic (except in slight operations of the eye, in which local anæsthesia with cocaine is sufficient). For general anæsthesia we use ether or chloroform, or in cases where small tumors or warts, etc., are to be removed. In that case for local anæsthesia we use the spray of ether or ethyl chloride or local subcutaneous injections of solutions of cocaine hydrochlorate. The inhalers used in anæsthesia consist of modifications of cones or cylinders. the commonest being a cylinder of tin with open perforated tin or wire at one end and containing a sponge to hold the anæsthetic. This is placed over the nose of the animal. A large number of modifications of this simple apparatus are used, varying from a wire muzzle or an ordinary tumbler or a flower pot to the elaborate apparatus advised by Hobday and described in the "Surgical Diseases of the Dog and Cat." This apparatus consists of a mask that has the form of an elongated blunt cone, having a stopcock at one end where the tube enters that carries the anæsthetic into the apparatus. This is fixed on the head by means of a collar, and a circular continuation of the cone made of soft cloth, which is adjustable, is fitted over the face. A container with a broad base to prevent any chance of it being overturned contains the anæsthetic. This container has two openings—one to connect the tube and the other to allow the admission of air to mix with the vapor of the anæsthetic. Connecting the container and the mask is a bulb apparatus usually seen on the thermo-cautery.

The muzzle apparatus is fixed on the animal's head, and by means of the bulb the mixed vapor is blown into the muzzle and directly on the animal's nose, thus preventing the irritation of the direct contact of the ether or chloroform. By means of the stop-cock the supply of vapor can be stopped instantly, or, if need be, the whole apparatus can be slipped over the animal's head or the rubber tube can be pulled from the container and a supply or pure air blown directly on the animal's nostrils.

In the administration of the anæsthetic we must take care that a certain amount of air is inhaled with the vapor of the anæsthetic. The pulse, respiration, and reaction of the eyelids must be watched at the same time. After a few inhalations we notice a period of excitement which is marked by great restlessness, howling, groaning, and, in rare cases, delirium. This is followed in a short time by a period of depression, and after that the narcotic condition is completely established. The cornea has now become insensible—that is to say, there is no reflex action or closing of the eyelids when touched. The muscles are now entirely relaxed, fæces and urine are discharged involuntarily. This result is not always even or regular, but depends to a large extent on which of the above-mentioned remedies is used. For instance, in using ether the stage of excitement is usually prolonged (twenty to forty minutes) and in the stage of depression reflex excitement does not disappear immediately. Chloroform produces much quicker results, and, as a rule, answers fairly well, but it has one disadvantage—the attendant or administrator must be very careful not to push it too far, or it is apt to produce paralysis of the lungs or stop the action of the heart, causing death. We prefer to use a combined narcotic in the form of a subcutaneous injection. This injection consists of 0.01 to 0.5 of morphia muriate dissolved in water, and in order to prevent the possibility of too large a dose causing paralysis of the heart 0.002 to 0.005 of atropia sulphate should be added one-quarter to one-half an hour before the operation. Afterward the writer has found it necessary to carefully administer chloroform until the animal is completely anæsthetized, then follow up the operation with ether alone or alternating with the inhalation of ether and then chloroform. The narcotic stage is mild, the period of excitement short. Some prefer Billroth's mixture (chloroform 3 parts, ether and alcohol 1 part of each); there is also Wachsmuth's mixture (chloroform 5 parts, oleum terebinthinæ recti 1 part). In England the A. C. E. mixture (ethyl alcohol 1 part, chloroform 2 parts, and ether 3 parts) is largely used In America the morphia-ether procedure, that of giving from one-half to one grain of morphia twenty-five minutes before the operation and then giving ether during the operation is largely used. It is safe, its chief objection being that it induces more of less preliminary excitement and salivation. Cocaine for local application as in the eye is harmless as a rule, but subcutaneous injections of a large amount of concentrated solutions for local anæsthesia should be avoided as they are liable to cause grave symptoms of intoxication or even death. This may also occur in the administration of cocaine in suppositories in tenesmus and prolapsus of the rectum in young dogs, and in very small dogs a dose of cocaine ranging from 0.025 to 0.05 may produce indications of cocaine poisoning; consequently in weak young animals of the smaller breeds it should be used with great care. Milder local anæsthetics, such as acoin, eucaine, stovaine, novocaine, are recommended. As to the so-called lumbar anæsthesia of the spinal cord, it has been recommended for painless operations of the abdomen. The operation consists in putting the hyperdermic needle in the lumbo-sacral fossa, which is between the median iliac angles. Pfeiffer uses a 2 to 3 per cent. solution of stovaine; the weight of the dog determines the dose (0.007 to each kilo.).

The use of various animal sera, such as the anti-streptococcic and polyvalent sera, have been offered as a possible means of preventing wound infection. These sera undoubtedly are valuable and will ultimately, when better understood, be of great benefit therapeutically. At present, however, they are still in a state of evolution.

INTRAVENOUS INJECTIONS AND INFUSIONS; AUTOGENOUS BLOOD TREATMENT.

Any large superficial vein that is accessible to compression may be used for the purpose of intravenous injections and infusions. However, the Vena saphena is best suited for this purpose.

The patient is laid on the side and firmly secured. The leg is held by an assistant, the vena saphena distended by application of a tourniquet (rubber tubing or rubber band) or possibly the finger, and the injection needle inserted from below upward, i. e., in the direction of the blood stream and almost parallel to the surface of the skin. If the vein was properly punctured blood will flow from the opposite end of the needle. For an **intravenous** injection the syringe is then attached to the socket of the needle, the tourniquet released and the fluid gradually and slowly injcted.

For intravenous **infusion,** a properly fitted rubber tubing attached to a simple infusion apparatus (burette or simple glass funnel) is attached to the inserted needle whereby great care must be exercised to avoid lateral movement of the needle and possible injury of the vein wall. The tube must be attached while fluid is actively discharging. The tourniquet is then removed and the infusion allowed to proceed. The fluid must be blood warm. After withdrawing the needle the wound is closed with iodoform collodion.

The technic for obtaining blood for **autogenous blood treatment** is quite similar to that described above. The fresh blood, drawn from the vena saphena with a needle of appropriate size, is immediately injected into the subcutaneous tissue of the thoracic or abdominal wall. For subcutaneous infusions of physiological salt solution, for instance, the author much prefers a specially constructed, graduated glass cylinder with rubber bulb attachment.

The End.

INDEX

- ABDOMEN, condition of, 29
  - fatty deposits in, 152
  - puncture of, 155
- Abdominal cavity, opening of, 111
  - dropsy, 149, 308
  - hernia, 508
- Abscess of the anal glands, 123
  - of the gums, 64
  - of the kidneys, 283
  - of the liver, 163
  - of the lymphatic glands, 77
  - of the parotid, 71
- Absence or loss of the sexual desire, 333
- Acanthosis nigricans, 601
- Acarus demodex folliculorum, 612
- Acetic acid test, 271
- Achilles tendon, laceration of, 489
- Acne, 593
- Acute catarrh of the bowels, 84
    - of the bronchia, 209
    - of the stomach, 84
    - of the trachea, 209
  - diffuse peritonitis, 145
  - dyspepsia, 84
  - eczema, 585
  - endocarditis, 240
  - hyperæmia of the lung, 220
  - inflammation of the kidneys, 277
  - intestinal catarrh, 93
  - laryngeal catarrh, 201
  - laryngitis, 201
  - miliary tuberculosis, 430
  - nephritis, 277
  - parenchymatous hepatitis, 162
  - peritonitis, 144, 152
  - synovial inflammation of the joints, 470
- Adenoma, 633
- Adipositas universalis, 449
- Affection of the eyelids, 523
- African horse sickness, 622
- Air-passages, diseases of, 208
- Albumin, digestion of, 37
  - in urine, 270
- Albuminuria, 271
- Albumosuria, 273
- Alopecia, 597
- Alveolar periostitis, 62
- Amaurosis, 559
- Amblyopia, 559
- Amount of urine, 260
- Amputation of anus, 118
  - of bones, 465
  - of tail, 499
  - of toe, 504
- Amyloid kidney, 283
  - liver, 165
- Anæmia, 442
  - chronic, 443
  - of the brain, 351
- Anæsthesia, 342, 625, 639
- Anal glands, abscesses of, 123
  - pouches, inflammation of, 121
  - tumors of, 119
- Anamnesis, 2
- Anasarca, 9
- Anchylostomum uncinaria, 141
- Angina catarrhalis, 75
- Angioma, 633
- Anguillulidæ, 607
- Animal parasites, cutaneous affections caused by, 603
    - of the kidney, 286
- Ankyloblepharon, 523
- Anterior chamber, dropsy of, 556
- Anomalies of the iris, 554
- Anthracosis pulmonum, 220
- Anthrax, 409
- Anus, imperforate, 121
  - prolapsus of, 114
  - stitching of, 118
- Aortic valve, disease of, 245
  - opening, stenosis of, 245
- Appetite, lack of, 86
- Apoplexia, 352, 366
- Areca nut, 138
- Arsenical poisoning, 166
- Arteries, thrombosis, 252
- Arthritis deformans, 473
  - rheumatic, 472
- Articulations, diseases of, 469
- Ascites, 149
- Ascaris marginata, 125
  - mystax, 125
- Asthma, 211-221
- Ataxia, 348
- Atelectasis, 215, 223
- Atresia ani, 121
- Auscultation of the lungs, 188
  - of the thorax, 188
- Autogenous blood treatment, 642

- BACTERIA in the urine, 269
- Basedow's disease, 382
- Bedbug, 607
- Belching, 39, 41
- Bench-show distemper, 402
- Benzidin test, 266
- Bile color in urine, 275
- Bismuth test, 273

- Bitch, castration of, 334
  - inguinal hernia in, 516
  - menstruation of, 258
- Bite, frost, 496
  - snake, 497
- Black cataract, 559
  - tongue, 404
- Bladder, catarrh of, 288
  - cramp of, 302
  - debility of, 292
  - diseases of the, 288
  - examination of, 259
  - inflammation of the, 288
  - neo-formation of, 302
  - paralysis of, 292
  - retroflection of, 303
  - stone in, 294
- Bleeding at the nose, 196
  - disease, 451
- Blennorrhœa, ophthalmic, 535
- Blood, diseases of the, 440
  - filaria in, 253
  - microscopy of the, 440
  - worms in the, 252
- Bloodvessels, diseases of the, 252
  - inflammation of, 308
- Bloody stools, 50
- Body, increased temperature of, 14
  - structure and constitution of, 4
  - subnormal temperature of, 17
- Bones, diseases of, 453
  - fractures of, 456
  - neo-formations of, 467
  - softening of, 456
  - union of fractured, 459
- Botfly, emasculation, 319
- Bowels, condition of, 42
  - catarrh of, 93
  - chronic catarrh of, 95
- Brain, anæmia of, 351
  - concussion of, 354
  - diseases of, 350
  - œdema and parasites of, 358
  - hyperæmia of, 350
  - inflammation of, 354
  - rare diseases of, 357
  - traumatic lesions of, 354
- Breathing, 182
- Breath, foul, 175
- Bronchia, acute catarrh of, 209
  - chronic catarrh of, 208
- Bronchial asthma, 221
  - catarrh, infectious, 402
  - tubes, diseases of, 208
- Bronchiolitis, 210
- Bronchitis, 208
  - capillaris, 210
  - catarrhalis, 208
  - parasitic, 214
- Bronchocele, 383
- Broncho-pneumonia, 214
- Bruits of the heart, 235
- Burns and scalds, 495
- Bursa mucosa, diseases of, 489

- CACHEXIA strumipriva, 382
- Cæsarean section, 321
- Calculi, renal, 286
- Cancer of prostate, 312
  - of stomach, 92
- Canina bubo, 600
- Canker, external, 570
  - of the ear, parasitic, 577
- Carbolic-acid poisoning, 167
- Carcinoma, 630
  - ventriculi, 92
- Caries of the teeth, 63
- Castration, 319, 388
  - in the bitch, 334
  - of the male, 319, 515
- Catalepsy, 379
- Cataract, 547
  - black, 559
- Catarrh, acute, of bronchia, 209
    - laryngeal, 201
    - of intestines, 93
  - chronic, of bowels, 95
    - of bronchia, 208
  - infectious bronchial, 402
  - nasal, 194
  - of frontal sinuses, 198
  - of larynx, 201
  - of the bladder, 288
  - of the bowels, 93
  - of the nose, 194
  - of the stomach, 87
  - of the uterus, 325
  - of the windpipe and bronchia, 208
  - preputial, 315
- Catarrhal conjunctivitis, 531
  - inflammation of the lungs, 214
  - jaundice, 157
  - metritis, 325
  - pneumonia, 214
- Catheter, passing of, 255
- Cavity of the chest, puncturing, 227
  - of the mouth, malformations of, 67
- Cerebral hemorrhage, 352
- Cerebral membranes, inflammation of, 355
- Cerebro-spinal meningitis, 358
- Cestodes, 128
- Charbon, 410
- Chest, dropsy of the, 229
  - puncture of the cavity of the, 227
  - shape of the cavity of the, 179
  - sensitiveness to pressure, 179
- Chloroform, 138, 169
- Chlorosis, 444
- Chondroma, 634
- Chorea, 375
- Choroid, inflammation of the, 555

Chronic catarrh of the bowels, 95
    of the bronchia, 209
    of the larynx, 203
    of the nose, 172
    of the stomach, 87
  constipation, 112
  dyspepsia, 87
  eczema, 586
  endocarditis, 242
  hydrocephalus, 357
  induration of the lungs, 217
  inflammation of the kidneys, 280
    of the spinal cord, 362
  interstitial hepatitis, 162
    nephritis, 280
    pneumonia, 217
  laryngitis, 203
  nephritis, 280
  parenchymatous nephritis, 280
  peritonitis, 145, 148, 152
  prostatitis, 311
  serous inflammation of the joints, 471
  tuberculosis, 431
Cimex lectularius, 607
Circulatory apparatus, diseases of the, 232
Circumscribed peritonitis, 146
Cirrhosis of the liver, 162
  of the lungs, 217
Claws and foot-pads, diseases of the, 502
Claws, inflamed, 503
  ingrowing, 502
Cold in the head, 194
Collections of urine in the bladder, 152, 292
Color of urine, 262
Coma, 3
Concussion of the brain, 354
Condition of the larynx and windpipe, 175
  of the lungs, 178
  of the mouth and throat, 20
  nutritive, 5
  psychological, 3
Condylomata canine, 634
Congestion of the lungs, 220
Congestive hyperæmia of the liver, 161
conjunctiva, diseases of, 530
  inflammation of, 530
  neo-formations on, 535
Conjunctivitis, 530
  catarrhal, 531
  follicularis of the membrana nictitans, 532
  in distemper, 400
  purulent, 532
Constipation, 48, 102
  chronic, 112
Constitutional diseases, 440
Contagious catarrhal fever, 386
Contusions, 493
  and wounds of pads, 505
  of the joints, 478
Convulsions, 347
  of the diaphragm, 380
Convulsive cough, 203
Cornea, abscesses of the, 538
  astigmatism of the, 563
  diseases of the, 535
  dermoid of, 543
  inflammation of the, 535
  injuries of, 544
  parenchymatous inflammation of the, 537
  ulceration of the, 539
Corneal opacities, 545
Coryza, 194
Costiveness, 102
Cough, 182
  chronic irritable, 203
  convulsive, 203
Coverings of the brain, diseases of, 350
Cramp of the bladder, 303
Croupal pneumonia, 220
Croupous inflammation of the lungs, 220
Cross eye, 562
Crystalline lens, diseases of, 547
Ctenocephalis canis, 604
Cutaneous affections caused by animal parasites, 603
    caused by vegetable parasites, 618
  membrane, inflammatory conditions of, 579
Cuterebro emasculator, 319
Cystic stones, 294
Cysticercus and trichina, 488
Cystitis, 288
Cystospasmus, 302
Cystotomy, 300
Cysts, serous, of the ear, 564

DEAFNESS, partial or complete, 576
Debility of the bladder, 292
Decayed meat poisoning, 101
Dentition, 65
Depression, 341
Dermatophagus canis, 577, 607
Dermoid of the cornea, 543
Detachment of the retina, 558
Diabetes insipidus, 448
  mellitus, 446
Diaphragm, convulsion of the, 380
Diarrhœa, 93
Diastasis of the vertebral column, 366
Diffuse peritonitis, 145
Digestive apparatus, examination of, 19
Digestion of albumin, 37
  of hydrocarbonaceous food, 37
  of meat, 36
  of milk, 37

  of starch, 38
  of the stomach on a meat diet, 36
Dilatation of the heart, 247
  of the pelvis of the kidney, 285
  of the œsophagus, 82
Dilatatio ventriculi, 89
Dipylidium caninum, 131
Diseased malformations of the joints, 473
Diseases, constitutional, 440
  of the air passages, 208
  of the aortic valve, 245
  of the articulations, 469
  of the bones, 453
  of the bladder, 288
  of the blood and metabolism, 440
  of the brain and its coverings, 350
  of the bronchial tubes, 208
  of the bursa mucosa, 356
  of the circulatory apparatus, 232
  of the claws and foot-pads, 502
  of the conjunctiva, 530
  of the cornea, 535
  of the crystalline lens, 547
  of the digestive apparatus, 19
  of the ear, 564
  of the eyes, 523
  of the female sexual organs, 321
  of the heart, 240
    muscle, 245
  of the inestines, 93
  of the kidneys, 276
  of the lachrymal organs, 528
  of the larynx, 201
  of the lens, 547
  of the liver, 157
  of the lungs, 214
  of the male sexual organs, 309
  of the mammary glands, 337
  of the membrana nictitans, 529
  of the mouth, tongue, and salivary glands, 55
  of the muscles, 252
  of the nasal cavities, 194
  of the nervous portion of the eye, 553
  of the nervous system, 339
  of the œsophagus, 77
  of the optic nerve, 553
  of the organs of locomotion, 453
  of the penis and prepuce, 313
  of the pericardium, 249
  of the peritoneum, 144
  of the pleura, 223
  of the prostate, 309
  of the respiratory organs, 171
  of the retina, 553
  of the salivary glands, 70
  of the sclerotic membrane of the eye, 553
  of the sexual organs, 303
  of the skin, 579
  of the spinal cord and its coverings, 359
  of the stomach, 84
  of the teeth, 60
  of the tendons, 489
  of the testicle and its covering, 316
  of the thyroid gland, 382
  of the tongue, 55
  of the urinary apparatus, 254
  of the uveal tract, 553
  of the vagina and the uterus, 321
  of the vitreous humor, 553
  of true infection, 386
  septic and pyæmic, 408
Disinfection of wounds, 492
Dislocation of the elbow, 481
  of the hip, 485
  of the lens, 552
  of the lower jaw, 481
  of the patella, 482
Dislocations, 479
Distemper, 386
  bench-show, 402
  false, 402
Distoma echinatum, 144
  heterophytes, 144
Distortions of the joints, 478
Disturbance of motility, 343
  of the psychic functions, 341
  of reflex irritability, 349
  of sensitiveness, 342
Diuretics in dropsy, 154
Diverticulum of the rectum, 123
Dochmius, 141
  trigonocephala, 141
Dog flea, 604
  lice, 605
  parasites, 603
  plague, 404
  strangles, 602
Dropsy, abdominal, 149, 308
  of the anterior chamber of the eye, 556
  of the chest, 229
  of the pericardium, 251
Dura mater, inflammation of, 355
Dyspepsia, 84
  chronic, 87
Dysphasia paralytica, 83

EAR, diseases of, 564
  inflammation of external, 570
  parasitic canker, 577
    diseases of the, 577
Eclampsia, 377
Ectasia, 82
Ectropion, 525
Eczema, 583
  chronic, 586
  dry, 586

- moist, or acute, 585
- of the toes, 589
- seborrhœicum, 588

Elbow, dislocation of, 481
- hygroma of the, 491

Elephantiasis, 602
Emasculating bot-fly, 319
Emetics, 35
Emphysema, 10
- of the lungs, 209, 220

Empyema, 198
Encephalitis, 355
Endocarditis, acute, 240
- ulcerosa, 240
- verucosa, 240

Enteritis catarrhalis, 93
Enterotomy laparo, 110
Enterectomy, 112
Entero-anastomosis, 112
Entropion, 523
- operation for, 524

Enucleation, 561
Epididymitis, 317
Epilepsy, 372
Epistaxis, 196
Epithelium in the urine, 268
Epulides, 67
Erythema, 580
Erysipelas, 492
Examination, general, 1
- of the bladder, 259
- of the digestive apparatus, 19
- of the circulatory apparatus, 232
- of the heart, 232
- of the kidney, 260
- of the mouth and throat, 20
- of the nervous system, 339
- of the nose, 171
- of the prostate, 258
- of the sexual organs, 303
- of the stomach, 31
- of the urethra, 254
- of the urinary apparatus, 254
- of the urine, 260

Exarticulation, 466
Excessive venereal excitement, 334
Excitement, 341
Exophthalmus, 559
External canker, 570
- concha, ulceration of the, 568

Eyeball, prolapse of, 559
- removal of, 561

Eyes, diseases of the, 523
Eyelids, affections of, 523
- inversion of, 523
- turning in of, 523
- turning out of, 525
- inflammation of the, 527

Eye, dropsy of the anterior chamber, 556
- enucleation of, 561
- opening the capsule of, 549
- purulent inflammation of, 555
- removal of the, 561
- squinting of, 552
- tumor of, 528

Expansion of the stomach, 89

FACIAL nerves, paralysis of the, 368
- twitching, 371

Faeces, 46
Falling out of the hair, 597
- sickness, 372

False distemper, 402
Fatty liver, 164
Favus, 619
Fehling's test, 279
Female sexual organs, diseases of, 321
Femoral hernia, 520
Fermentation test, 274
Fever, 14
- aseptic wound, 496
- puerperal, 326
- purulent, 497
- septic wound, 496
- splenic, 410

Fibrinous pneumonia, 220
Fibroma, 625
Fillaria, hæmatica, 253
- immitis, 253, 618
- in the blood, 253
- medinensis, 618
- sanguinolenta, 254
- tracheo-bronchialis, 214

Fistula, fæcal and intestinal, 511
Flap amputation, 466
Flea, dog, 604
Follicular mange, 612
Foreign bodies in œsophagus, 77
- in the stomach, 90
- in the tongue, 58
- substances in urine, 265

Foul breath, 175
Fractures, general classification of, 456
- of the bones, 456
- union of, 459

Frontal sinuses, catarrh of the, 198
Frost-bite, 496
Furunculosis, 593

GALLSTONES, 164
Gangrene of the tongue, 59
Gastricismus, 84
Gastrectasis, 89
Gastritis catarrhalis, 84, 87
Gastro-enteritis, hemorrhagic, 404
- toxica, 100

Gastro-intestinal inflammation, 101
General classification of fractures, 456
Gingivitis, 56
Glands, anal, abscesses of, 123
Glaucoma, 556

Gmelin's test, 275
Goitre, 383
Gonorrhœa of the prepuce, 315
Granuloma venereal, 634
Guaiacol test, 266

HÆMAGLOBINEMIA, 451
Hæmatothorax, 231
Hæmatozoon, Lewisi, 254
    subulatum, 254
Hair follicles, inflammation of, 593
Hair, falling out of, 597
Hammerstein's test, 275
Hardening of the liver, 162
Harvest bug, 606
Head, cold in, 194
    mucous membranes of, 6
Heart, dilatation of the, 247
    diseases of the, 240
    envelope, inflammation of the, 249
    muscles, parasites in the, 249
        disease of the, 247
    nervous palpitation of the, 249
    palpitations, 249
    sounds of the, 235
    tumors of the, 249
    valvular defects of the, 242
        diseases of the, 242
Hæmatoma, 564
Hæmaturia, 266
Hæmaeopinus piliferus, 605
Hæmoglobinuria, 433
Hæmopericardium, 252
Heller's test, 265, 270
Helminthiasis, 125
Hemato-thorax, 231
Hemiplegia laryngis, 207
Hemoglobinuria and piroplasmosis, 443
Hemophilia, 451
Hemophthalmus, 557
Hemorrhage, cerebral, 352
    of the pericardium, 252
    of the spinal cord, 366
    of the retina, 558
Hemorrhoids, 124
Hepar, adiposum, 164
Hepatitis, 162
    acute parenchymatous, 162
    interstitial, 162
Hernia, 508
    abdominal, 508
    femoral, 308, 520
    inguinal, 514
        in the bitch, 516
    irreducible, 510
    perineal, 521
    pseudo-perineal, 123
    reducible, 509
    scrotal, 514
  umbilical, 518
Herniotomy, 513
Herpes tonsurans, 620
Hiccough, convulsive, 380
Hip, dislocation of the, 485
Hodgkin's disease, 445
Honey cysts, 73
Hook worm, 141
Hordeolum, 527
Hydrocarbonaceous food digestion, 37
Hydrocephalus, 357
Hydrocele, 518
Hydrocyanic-acid poisoning, 167
Hydrometra, 308
Hydronephrosis, 285
Hydrophobia, 411
Hydropericardium, 251
Hydrophthalmus, 556
Hydrops abdominis, 149
    ascites, 149
    peritonei, 149
Hydrothorax, 229
Hygroma of the elbow, 491
Hyperacidity, 38
Hyperæmia of the brain, 350
    of the liver, 161
    renal, 282
Hyperæsthesia, 343
Hypertrophy, idiopathic, 247
    of the prostate, 311
Hysterotomy, 331

ICTERUS catarrhalis, 157
    gastro-duodenalis, 157
Imperforate anus, 121
Impetigo, 600
Increased temperature, 14
Indican, 275
    tests, 276
Induration, chronic, of the lungs, 217
Infectious bronchial catarrh, 402
    genital tumors, 634
    hemorrhagic gastro-enteritis, 404
Inflammatory conditions of the cutaneous membrane, 579
Inflammation, mycotic, of the stomach and intestines, 101
    of the anal pouches, 121
    of the bladder, 288
    of the brain, 354
    of the brain-mass, 355
    of the cerebral matter, 355
    of the cerebral membranes, 355
    of the choroid, 555
    of the conjunctiva, 530
    of the dura mater, 355
    of the external auditory canal, 570
    of the eyelids, 527
    of the hair-follicles, 593
    of the heart envelope, 249
    of the interdigital web, 506
    of the iris, 555
    of the joints, 469

        - rheumatic, 472
        - synovial, 470
    - of the kidneys, 276
    - of the liver, 162
    - of the lungs, 214, 220
    - of the mammary gland, 337
    - of the mucous membranes of the mouth, 55
    - of the mucous membranes of the throat, 75
    - of the papilla of the optic nerve, 558
    - of the pelvis of the kidney, 284
    - of the pericardium, 249
    - of the peritoneum, 144
    - of the pleura, 223
    - of the prostate, 309
    - of the rectum, 98
    - of the scrotum, 316
    - of the sclerotic coat, 553
    - of the spinal cord, chronic, 362
    - of the testicle, 316
    - of the uterus, 321, 325
    - of the urethra, 303
    - of the vagina, 321
    - of the vulva and vagina, 321
    - purulent, of the kidneys, 283
        - of the liver, 163
    - toxic, of the stomach and intestines, 101
- Inflamed claws, 503
- Inguinal hernia, 514
    - in the bitch, 516
- Ingrowing claws, 502
- Injuries of the cornea, 544
    - of the joints, 476
    - of the œsophagus, 81
    - to the testicles and scrotum, 318
- Interdigital web, 506
- Interstitial hepatitis, 162
    - pneumonia, chronic, 217
- Intestinal parasites, 125
    - catarrh, 93
    - invagination, 111
- Intestines, 42
    - constriction of, 102
    - diseases of, 93
    - mycotic inflammation of, 101
    - obstruction of, 103
    - toxic inflammation of, 101
- Intravenous injections and infusions, 642
- Inversion of the eyelid, 523
    - of the stomach, 89
- Iodoform-poisoning, 167
- Irreducible hernia, 510
- Irregularities of the sexual instinct, 333
- Iris, anomalies of the, 554
    - coloboma, 555
    - inflammation of, 555
- Irritable cough, chronic, 203
    - Iritis, 555
- Ischiadicus, paralysis of the, 369
- Ischuria, 296
- Itching skin without presence of nodule formation, 588
- Ixodes ricinus, 606

- JAUNDICE, catarrhal, 157
    - malignant, 434
- Jaw, dislocation of, 481
- Joints, acute, synovial inflammation of, 470
    - chronic serous inflammation, 471
    - contusions of, 478
    - distortions of, 478
    - inflammation of, 461
    - injuries of, 476
    - luxations of, 479
    - malformation of, 473
    - puncturing of, 475
    - purulent inflammation of, 471
    - rheumatic inflammation of, 472
    - suppuration of, 471
    - wounds of, 476

- KAMALA, 138
    - Keratitis, 535
    - desiccative, 545
    - parenchymatosa, 400, 537
    - profunda, 537
    - superficialis, 536
- Keratosis, 601
- Kidneys, abscess of, 283
    - acute inflammation of, 277
    - amyloid, 283
    - animal parasites of the, 286
    - chronic inflammation of, 280
    - dilatation of the pelvis of the, 285
    - diseases of, 276
    - examination of the, 260
    - inflammation of, 276
        - of the pelvis, 284
    - tumors of the, 286
- Koch's test, 270
- Kusso, 138

- LACHRYMAL organs, diseases of the, 528
- Laparo-enterotomy, 110
- Lardaceous liver, 165
- Lagyngeal catarrh, acute, 201
    - hemiplegia, 207
    - tumors, 207
    - whistling, 207
- Laryngitis, acute, 201
    - chronic, 203
- Larynx, and windpipe, condition of the, 175
    - chronic catarrh of, 203
    - diseases of, 201
- Leishmaniosis, 436

Lens, dislocation of the, 552
Leptomeningitis, 355
Leptus autumnalis, 606
Leucoma, 545
Leukæmia, 444
Lice, dog, 605
Linear, extraction, 550
Linguatula denticulata, 199
  tænioides, 198
Lipoma, 627
Lips, incomplete closure of, 23
Lithiasis, 294
Liver, abscess of, 163
  amyloid, 165
  cirrhosis of, 162
  condition of the, 52
  congestive hyperæmia of, 161
  diseases of, 157
  fatty, 164
  hardening of, 162
  hyperæmia of, 161
  inflammation of, 162
  lardaceous, 165
  neo-formations of, 164
  parasites of, 165
  purulent inflammation of, 163
Lobular extraction, 551
  pneumonia, 214
Lockjaw, 437
Locomotion, diseases of organs of, 453
Lower jaw, dislocation of, 481
Lumbar puncture, 341
Lungs, acute hyperæmia of, 220
  auscultation of the, 188
  blackening of the, 220
  catarrhal inflammation of, 214
  chronic induration of, 217
  cirrhosis of, 217
  condition of the, 178
  congestion of the, 220
  croupous inflammation of the, 220
  diseases of, 214
  emphysema of, 209, 220
  neo-formation of the, 221
  œdema of, 217, 218
Luxations of the joints, 479
  of the spine, 367
Lymphadenia, 445
Lymphatic glands, 11
Lyssa, 411

MAGGOTS, 607
  Male, castration of the, 319
  fern, 137
  sexual organs, diseases of, 309
Malformation of the joints, 473
  of the rectum and anus, 119
Malformations of the cavity of the
  œdema, 409
  pustule, 410
 mouth, 67

Malignant jaundice, 434
Mammary gland, diseases of the, 337
    inflammation of, 337
    neo-formation of the, 338
Mammitis, 337
Mange, follicular, 612
  red, 583
  sarcoptic, 608
  scab, 586
Mastitis, 309, 337
Maw worms, 125
Meat-diet, digestion, 36
Medulla oblongata, paralysis of, 358
Membrana nictitans, diseases of the, 529
Meningitis, spinal, 359
Menstruation of bitch, 258
Mercury-poisoning, 169
Metabolism, 440
Metritis, 325
  catarrhal, 325
  septic, 326
  superficial, 325
Milk-digestion, 37
Mitrals, insufficiency of the, 244
Moist eczema, 585
Morbus maculosis, 452
Motility, disturbance of, 343
Motor paralysis of the trigeminus, 368
Mouth and throat, condition of the, 20
  examination of, 20
  diseases of, 55
    the mucous membrane of, 55
  malformations of, 67
  ulcerous inflammation of, 57
Mouth, warts in, 67
Mucous cysts, 73
  membrane of the mouth, disease of, 55
  membranes of the head, 6
  membranes of the throat, inflammation of, 75
  ulcerous inflammation of, 57
Multiple periostitis, 467
Mumps, 70
Muscles, diseases of the, 486
Muscular rheumatism, 483
Mycosis fungoides, 602
Mycotic inflammation of the stomach and intestines, 101
Myelitis, 359, 365
Myocarditis, 248
Myofibroma, 329
Myoma, 633
Myxoma, 632

NASAL catarrh, 194
  cavities, diseases of, 194
    tumors of the, 197
Necrotic stomatitis, 57
Neoformation of the bladder, 302
  of the bones, 467
  of the glans penis and prepuce, 315

  of the liver, 164
  of the lungs, 221
  of the mammary glands, 337
  of the testicles, 318
  of the uterus, 329
  of the vagina, 324
Nephritic stones, 286
Nephritis, 276
  acute, 277
  chronic, 280
  suppurative, 283
Nephrolithiasis, 286
Nerves, paralysis of the, 368
Nervous palpitation of the heart, 249
  portion of the eye, diseases of, 553
  system, diseases of, 339
    examination of, 339
Nettlerash, 582
Noma, 600
Nose, bleeding of the, 196
  catarrh of, 172
  examination of, 171
Number and character of the respiratory movements, 179
Nutritive condition, general examination of, 4
Nux-vomica poisoning, 169
Nymphomania, 334
Nystagmus, 563

OBESITY, 449
Obstetrics, 329
Obstipation, 102
Obstruction of the intestines, 103
Obturatio intestini, 102
Obturator nerve, paralysis of the, 370
Occlusio intestini, 102
Odor of urine, 264
Œdema, and parasites of the brain, 358
  of the lungs, 218
  malignant, 409
Œsophagotomy, 81
Œsophagus, condition of, 28
  diseases of, 77
  dilatation of, 82
  foreign bodies in, 77
  injuries, 81
  paralysis, 83
  strictures, 82
Opening of the capsule of the eye, 549
Operation for entropion, 395
  on the linea alba, 335
Optic nerve, disease of, 424
Orchitis, 305, 316
Osteoma, 487
Osteomalaciæ, 456
Ostitismus universalis, 467
Othematoma, 564
Otitis externa, 570
  parasitic, 577
Ovariotomy, 334
Oxyuris vermicularis, 144

PACHYDERMIA, 602
Pachymeningitis, 355, 363
Panophthalmitis, 555
Pads, contusion of the, 505
Palpation, 13
Panaritium, 503
Palpitation of the heart, 249
Pancreas, 55
Papilla, congested, 558
Papilla of the optic nerve, inflammation of the, 558
Papilloma, 629
Paralysis, 343
  of the anterior limbs, 344
  of the bladder, 292
  of the cruralis, 344-370
  of the facial nerves, 368
  of the ischiadius, 369
  of the Masseter muscle, 368
  of the medulla oblongata, 358
  of the nerves, 364
  of the obturator nerve, 370
  of the oesophagus, 83
  of the pharynx, 77
  of the posterior limbs, 341
  of the radial nerve, 369
  pharyngis, 77
Paraphimosis, 304-313
Parasites, 125
  dog, 605
  in the brain, 358
  in the heart muscles, 249
  in the liver, 165
  intestinal, 125
  of the kidney, 286
  of the stomach, 92
  tapeworm, 128
Parasitic, bronchitis, 214
  canker of the ear, 577
  otitis, 577
Parenchymatous hepatitis, 162
  nephritis, chronic, 280
Parotid, abscess of, 71
Parotitis, 70
Passing the catheter, 255
Patella, dislocation of, 482
Pelvis of the kidney, inflammation of, 284
Pemphigus, 600
Penis, diseases of, 313
Pentastoma denticulatum, 199
  influenza, 198
  tænioides, 191
Percussion of the thorax, 186
Pericardium, diseases of the, 249
  dropsy of the, 251
  hemorrhage of the, 252
Pericarditis, 249
Perineal hernia, 521
Periostitis alveolar, 62
  multiple, 467
Persistent papillary membrane, 554

Peritonitis, 144
    acute diffuse, 145
    chronic, 146-148
    circumscribed, 146
Peritoneum, diseases of, 144
    inflammation of, 144
Pharyngitis, 75
Phenylhydrazin test, 274
Phimosis, 304-313
Phlegmone, 492
Phloroglucin Test, 38
Phosphorus poisoning, 169
Phthisis, 217
Piroplasma canis, 434
Piroplasmosis and hemoglobinuria, 433
Pleura, diseases of, 223
    inflammation of, 223
Pleural tuberculosis, 428
Pleurisy, 223
Pleuritis, 223
Pneumonia, 214
    broncho-, 214
    catarrhal, 214
    chronic interstitial, 217
    croupal, 220
    fibrinous, 220
    lobular, 214
    traumatic, 214
Pneumopercardium, 252
Pneumothorax, 230
Poisoning by arsenic, 166
    by carbolic acid, 167
    by caustic alkalies, 165
        acids, 165
    by chloroform, 169
    by fern extract, 170
    by gas, coal, carbondioxide or illuminating, 170
    by hydrocyanic acid, 167
    by iodine, 167
    by iodoform, 167
    by mercury, 169
    by mycotic decayed meat, 101
    by nux vomica, 169
    by phenol, 170
    by phosphorus, 168
    by prussic acid, 167
    by santonin, 171
    by strychnine, 169
    urinary, 287
Poisons, 165
Pomegranate, 138
Polyuria, 283
Polyneuritis infectiosa, 371
Posterior limbs, paralysis of, 341
Prepuce, diseases of, 303-313
    gonorrhœa of, 315
    neo-formations of, 315
Priapismus, 304
Priessnitz's compress, 452
Proctitis, 90
Proglottides, 128
Prolapse of the eyeball, 559
    of resti et ani, 114
    of the uterus, 322-328
    of the vagina, 322
Prolapsus bulbi oculi, 559
    of rectum, 114
    uteri, 322
    vaginæ, 322
Prostate, cancer of, 312
    diseases of, 305
    examination of, 258
    inflammation of, 309
    tumors of, 312
Prostatitis, 305-309
    chronic, 305-311
Prostotomy, 313
Prurigo, 598
Pruritus, 598
Pseudo-leukemia, 444
Pseudo-perineal hernia, 123
Psychosis, 380
Psychic functions, disturbance of the, 341
Psychological condition, 3
Pterygium, 544
Ptosis, 528
Ptyalism, 59
Puerperal fever, 326
Pulex, 604
Pulse, 238
Puncturing the abdomen, 155
    the cavity of the chest, 227
    the joints, 475
    the thoracic cavity, 193
Pupillary reflex, 349
Purulent conjunctivitis, 532
    inflammation of the eye, 555
        of the joints, 471
        of the kidneys, 283
        of the liver, 163
    ophthalmia, 532
Pus in the frontal sinuses, 198
Puncture of the cavity of the chest, 227
Pyarthrosis, 471
Pyelitis, 284
Pyometra, 308
Pyonephrosis, 284

RABIES, 411
Rachitis, 453
Radial nerve, paralysis of, 369
Ranula, 69
Rare diseases of the brain, 357
Reaction of urine, 263
Rectum, diverticulum of the, 123
    inflammation of, 98
Rectum, and anus, malformations of, 119
    prolapsus of, 114
Refraction, anomalies of, 563

Red mange, 583
Reducible hernia, 509
Removal of the eye-ball, 561
    of the membrana nicitans, 529
Renal calculi, 286
Renal cylinders, 268
    hyperæmia, 282
Respiratory apparatus, physical examination of, 171
    movements, number and character of, 179
    organs, diseases of, 171
Retina, detachment of, 558
    diseases of, 553
    hemorrhage of, 558
Retroflection of the bladder, 302
Reversion of the stomach, 89
Rhachitis, 453
Rheumatic arthritis, 472
    inflammation of the joints, 472
Rheumatism, muscular, 486
Rhinitis, 194
Rhinorrhagia, 196
Rickets, 453
Rosin's test, 275
Round worms, 125
Rupture, hernial, 508
    of the bladder, 198

SAINT Vitus dance, 375
Saliva, 26
Salivary glands, diseases of, 70
Sandflea, 604
Sarcocele, 518
Sarcoma, 627
Sarcopsylla penetrans, 604
Sarcoptes scabiei, 608
Sarcoptic mange, 608
Satyriasis, 334
Scab, 608
Scalds, burns and, 495
Sclerodermia, 607
Sclerotic membrane, diseases of, 553
Scrotum, inflammation of, 316
Scurvy, 451
Seat worm, 144
Seborrhœa, 599
    alcosa, 599
    præputi, 599
Sensitiveness, disturbance of, 342
Septic and pyæmic diseases, 408
    metritis, 326
Septicopyæmia and Septicemia, 408
Serous cyst of ear, 564
    inflammation of the joints, chronic, 468
Sexual apparatus, diseases of, 254
    desire, irregularities, 333
        loss of, 333
Singultus, 3
Shape of the cavity of the chest, 179
Sleepiness, persistent, 161
Skin affections caused by animal parasites, 608
    caused by vegetable parasites, 618
    and subcutaneous membranes, general examination of, 7
    diseases of, 579
        non-parasitic diseases of, 580
        caused by worms, 617, 677
Skull and spinal columns, abnormal condition, 339-340.
Snake bite, 497
Softening of the bones, 456
Sore-throat, 75
Sounds of the heart, 235
Specific gravity of urine, 264
Spectroscopy, 266
Spinal cord, diseases of, 359
    inflammation of, 359
    membranes, inflammation of, 359
    myelitis, 359
Spiroptera sanguinolenta, 77, 254
Spleen, 54
Splenic fever, 410
Sporozoic dermatoses, 622
Sprains, 478
Starch, digestion of, 38
Stenosis of the aortic opening, 245
    of the œsophagus, 82
    of the left aurico-ventral opening, 244
Stomacace, 57
Stomach, acute catarrh of, 84
    cancer of, 92
    condition of, 31
    chronic catarrh of, 87
    digestion of milk, 37
    dilatation of, 89
    diseases of, 84
    examination of, 31
    expansion of, 89
    foreign bodies in, 90
    inversion of, 89
    meat diet, digestion of, 36
    mycotic inflammation of, 101
    parasites of, 92
    reversion of, 89
    -pump, 35
    toxic inflammation of, 100
    ulceration of, 91
Stomatitis, 55
    necrotic, 57
    ulcerative, 57
Stone in the bladder, 294
Stones, nephritic, 286
Strabismus, 562
Streptothricosis, 437
Stricture of the œsophagus, 82
Stricture of the urethra, 303
Strongylus bronchialis canis, 214
    vasorum, 214, 254

Structure and constitution of the body, 4
Struma, acuta, 385
Strychnine poisoning, 169
Stuttgart, dog disease, 404
Sty, 327
Sugar in urine, 279
Sunstroke, 357
Superficial metritis, 325
Suppuration, of the joints, 471
Supperative nephritis, 283
Syndesmitis, 530
Synovitis acuta serosa, 470
  chronica serosa, 471
Synovial inflammation of the joints, 470
Syringomyelia, 367

TABES dorsalis, 367
Tænia, 128
  cœnurus, 131
  cucumerina, 131
  echinococcus, 133
  lineata, 134
  litterata, 134
  marginata, 131
  serialis, 134
  serrata, 125-129
Tæniafuges, 137
Tail, amputation of, 499
  wounds on the tip of, 498
Tapeworms, 128
Tapping the abdomen, 155
Teeth, caries of, 63
  deposits on the, 61
  diseases of, 60
  tartar of the, 61
Temperature, 14
  increased, 15
  subnormal, 17
Tendons, diseases of, 489
Test, acetic, 266-271
  benzidin, 266
  bismuth, 279
  fermentation, 274
  guaiacol, 266
  Heller's, 265-270
  Kochs', 270
  Trommer's, 279
  tuberculin, 432
Testicles, diseases of, 316
  inflammation of, 316
  injuries of, 318
  neoformations of, 318
Tetanus, 437
Therapeutics of tumors, 638
Thoracic cavity, puncturing, 193
Thorax, auscultation of, 188
  percussion of, 186
Throat, inflammation of the mucous membranes, 75
Thromboses of the femoral arteries, 252
Thyroid gland, diseases of, 382
  inflammation of, 385
  hypertrophy of, 383
Toe, amputation of, 504
Toes, eczema of, 589
Tongue bleating, 24
Tongue, diseases of, 55
  foreign bodies in, 58
  gangrene of, 59
Torsio ventriculi, 89
Toxic inflammation of the stomach and intestines, 101
Trachea, physical examination of, 117
Trachitis, 208
Traumatic lesions of the brain, 354
Treatment of wounds, 492
Trichina, 488
Trichocephalus, depressiusculus, 144
Trichodectes latus canis, 468-605
Tricuspid valves, insufficiency of, 245
Trigeminus, motor paralysis of, 368
Trommer's test, 273
True infection, diseases of, 386
Trypanosomiasis, 436-622
Tuberculin test, 432
Tuberculosis, 425
  pleural and pulmonary, 428
Tumors, 623
  cancerous, 630
  infectious genital, 634
  laryngeal, 207
  of the eye, 528
  of the heart, 249
  of the nasal cavities, 197
  of the prostate, 312
  of the kidneys, 286
  particularly those of the skin, 623
  therapeutics of, 638
Turning disease, 357
Turning in of the eyelid, 523
  out of the eyelid, 525
Twitching, facial, 371
Typhus-canine, 404

UDDER, 309
Umbilical hernia, 516
Ulceration of the cornea, 539
Ulcerations of the external concha, 568
  of the stomach, 91
Ulcerative stomatitis, 57
Ulcers and ulceration, 493
Ulcerous inflammation of mouth, 57
Ulcus ventriculi, 91
Uncinaria canina, 141
Union of fractures, 459
Uremia, 287-292
Urethra, examination of, 254
  inflammation of, 303
  stricture of, 301
Urethrotomy, 298

Urinary apparatus, examination of, 254
    diseases of, 254
    poisoning, 287
Urination by incontinence, 293
Urine, albumin in, 270
    amount of, 260
    blood in, 265
    bacteria, 269
    color of, 262
    crystals, 270
    epithelium in, 268
    examination of, 260
    foreign substances in, 265
    icteric, 262
    mucus in, 265
    odor of, 264
    pus in, 267
    reaction of, 263
    renal cylinders, 268
    specific gravity of, 264
    sugar in, 279
    transparency of, 263
    white blood corpuscles in, 267
Urticaria, 582
Uterus, diseases of, 325
    inflammation of, 325
    neo-formation of, 329
    prolapse of, 328
    removal of, 333
Uveal tract, diseases of the, 553

VAGINA, diseases of, 321
    inflammation of, 321
    nea formation of, 324
    prolapse of, 322
Vaginitis, 321
Valvular defects of the heart, 242
    diseases of the heart, 242
Vegetable parasites, cutaneous affections caused by, 618
Venereal granuloma, 634
Vertebral column, diastasis of, 366
Vitia cordis, 242
Vitreous humor, diseases of, 553-557
Volvulus ventriculi, 89
Vulva, discharges from the, 307
Vulva and vagina, inflammation of, 321

WARTS in the mouth, 68
Wheezing, 191
Whip worm, 144
Windpipe, 175-208
Woodtick, 606
Worms in the blood, 252
Worms, intestinal, 125
Wounds and their treatment, 492
    on the tip of the tail, 498

XEROSIS cornæa, 545

YAWNING, 42
Yellow mucous membranes, 159

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